December, 1948

THE FOUNDRY

wherever metals are cast...

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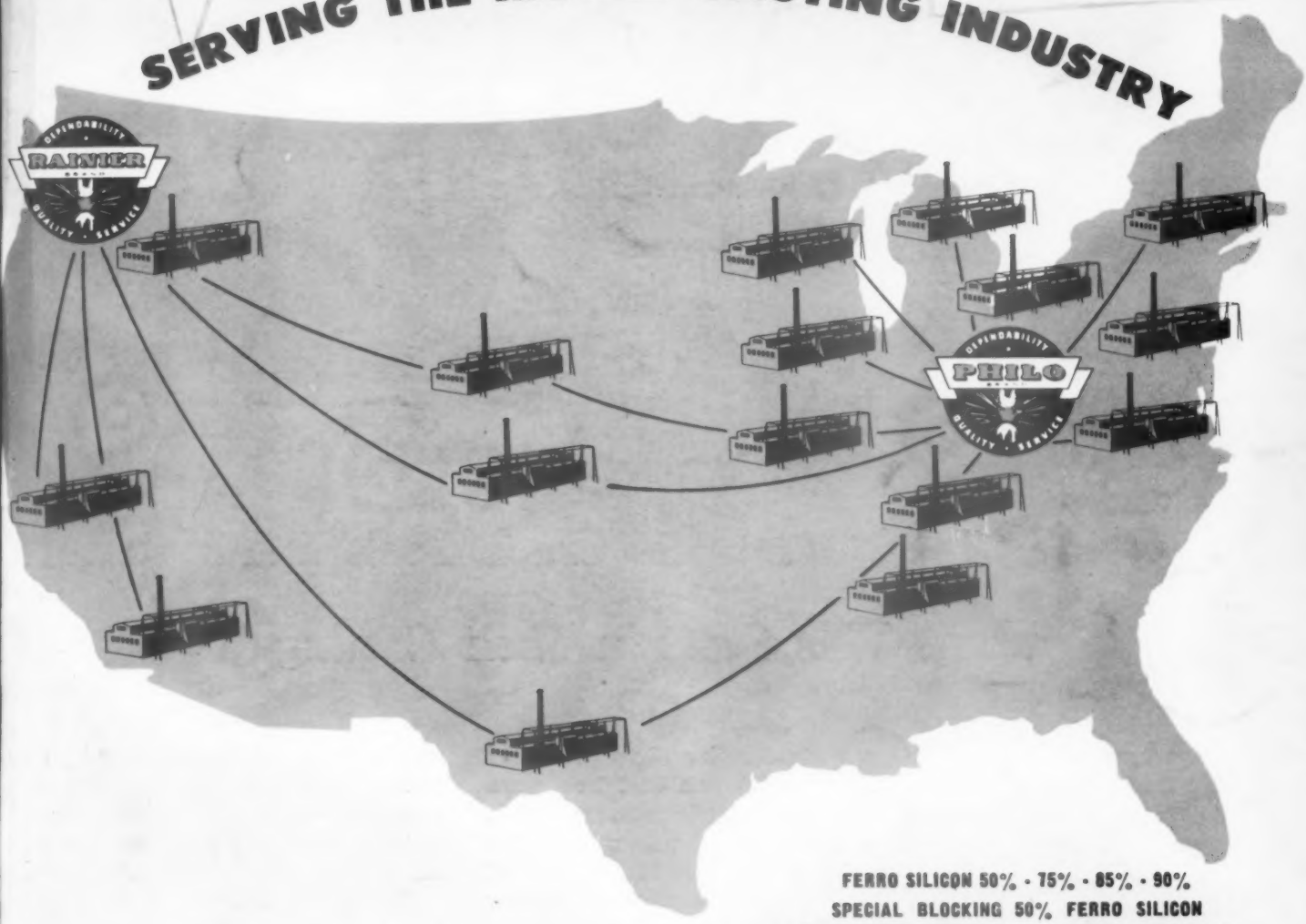
SERVING THE METAL CASTING INDUSTRY



FERRO SILICON 50% · 75% · 85% · 90%
SPECIAL BLOCKING 50% FERRO SILICON
H. C. FERRO CHROMIUM • FERRO MANGANESE
BOROSIL • SIMANAL

Briquets

SILICON • MANGANESE • CHROME

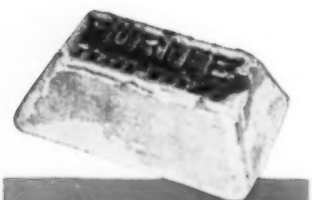
Ohio Ferro-Alloys Corporation
Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma

Gathering sea shells to be used in an early American furnace. In the foreground is the first Colonial pot cast in America.

Despite Crude Tools and Materials

There Was Craft in Their Castings!



PURITE is commercially pure soda ash containing over 98% sodium carbonate, fused and cast into convenient 2-lb. pigs. Its desulfurizing and refining action are traceable to the chemistry of soda ash.

Eighteenth century producers of American cast iron were handicapped by the tools and materials then available. Bog iron from the floors of ponds, lime in the form of sea shells, crude furnaces, and cruder mechanical appliances—these were the limitations. But in spite of such difficulties, the early American iron founders produced castings that showed resourcefulness and craft.

Consider the advance in foundry practice since these early days. Of course, foundries now have better materials and improved equipment – the forehearth, for instance, in which the molten iron is refined after coming from the cupola.

Modern foundries also have PURITE—an alkali prepared in two-pound pigs. PURITE reduces sulfur, deoxidizes the iron, and washes out occluded gases and entrained slag particles. The result is a clean, fluid iron with improved casting properties.

Let us send you our latest pamphlet giving details on the advantages of using PURITE. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

Mathieson

PURITE

Purite (Fused Soda Ash) . . . Liquid Chlorine
Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua
Sodium Chlorite Products . . . Chlorine Dioxide
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THEY'RE HARD

THEY'RE TOUGH

Omega for Shock-Resistance	
Normal working hardness	— Rockwell C, 58 to 60
Tensile strength	— 340,000 psi max.
Yield point	— 280,000 psi max.
Unnotched Charpy	— 130 foot pounds

Omega is a champion because it is a tool steel engineered for shock-resistance — combining hardness, toughness and ductility. There's no better steel for cold-battering jobs.

Omega chisels are ideal for pneumatic chippers, for they readily absorb impacting. They're good for hand chisels and core breakers, too. Cutting edges stay sharp; the shanks are non-peening.

Whether you buy finished chisels or make them up yourself, specify Omega for real chisel performance. Your nearest Bethlehem sales office or tool steel distributor can give you prompt delivery and service.

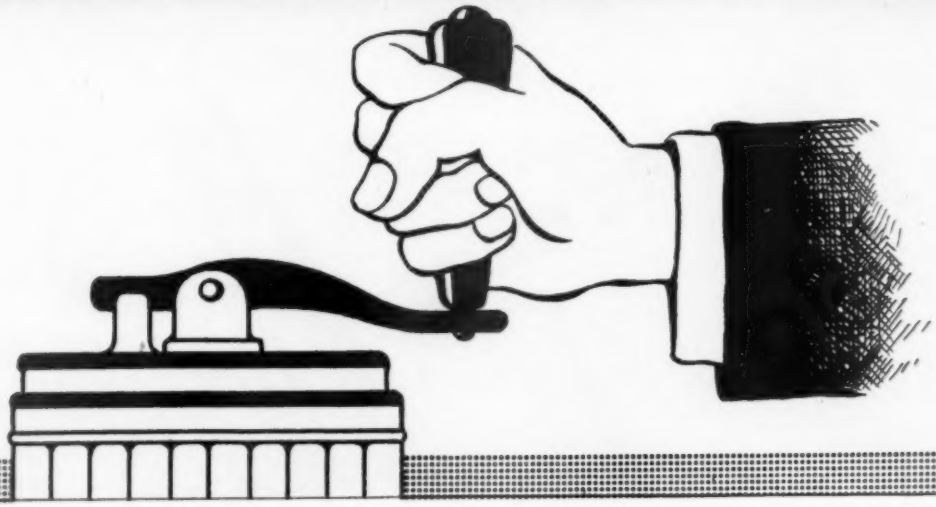
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export distributor: Bethlehem Steel Export Corporation

★ BETHLEHEM STEEL ★

OMEGA . . . one of Bethlehem's Fine Tool Steels



CONTROLLED STRENGTH

The motorman's touch controls the power of the current that drives the street car. It's that simple. In foundries everywhere,

FEDERAL Green Bond

controls sand strength by the proportion of its mix. It's that simple. GREEN BOND may be mixed to produce a firm, stable sand, or a sand that collapses readily and flows freely. GREEN BOND is always uniform, always dependable. The quality never varies in a bag or a carload. Its wide use and general acceptance by practical foundrymen is its best recommendation.

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DECEMBER, 1948

THE FOUNDRY

VOLUME 76—NUMBER 12

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THE FOUNDRY is published monthly by THE PENTON PUBLISHING CO., Penton Building, 1213 West Third Street, Cleveland, O. EARL L. SHANER, President and Treasurer; GEORGE O. HAYS, Vice President and General Manager; RUSSELL C. JAENKE, Vice President; FRANK G. STEINEBACH, Vice President and Secretary, and EDITH L. WERNER, Assistant Treasurer.

Subscription: In the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $3; two years, $5. Other foreign countries, $6. Single copies 35 cents. Copies published three months or more previous to date of current issue, 50 cents.

Member: Audit Bureau of Circulations, Associated Business Papers, National Publishers Association. Copyright 1948 by THE PENTON PUBLISHING CO.

Entered as second class matter at postoffice at Cleveland under act of March 3, 1879.

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USE LINOIL CORE MOLDS . .

INCREASED PRODUCTION . . . SIMPLIFIED PRODUCTION

Core molds can be produced much faster than green sand molds. Here, one-half the core mold (for two castings) is rammed-up in just 60 seconds. Note the clean, sharp draw and the perfect detail of the fins . . . which would be impossible to obtain in green sand. Core molds are quickly baked to preserve their accurate dimensions.

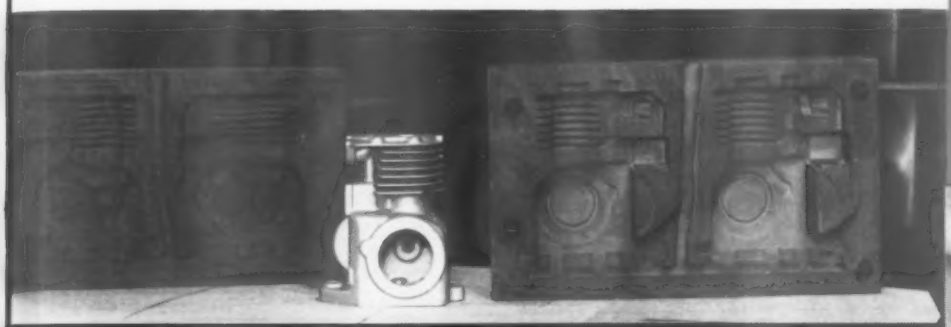
SIMPLIFIED PRODUCTION

Core Molds lend themselves readily to mass-production techniques . . . in blowing, baking, assembling and pouring. Here, each assembler does one job — for maximum efficiency. Core Molds can withstand repeated handlings, and they are open for inspection at every stage of operations. Cores are stock-piled, in advance, to keep production flowing smoothly.

TO INCREASE YOUR CASTING OUTPUT

THE BRILLION IRON WORKS, INC.
BRILLION, WISCONSIN

INCREASED PRODUCTION
•
SIMPLIFIED PRODUCTION
•
HIGHER CASTING QUALITY
•
LOWER SCRAP LOSSES
•
DECREASED CLEANING COSTS
•
INCREASED YIELD

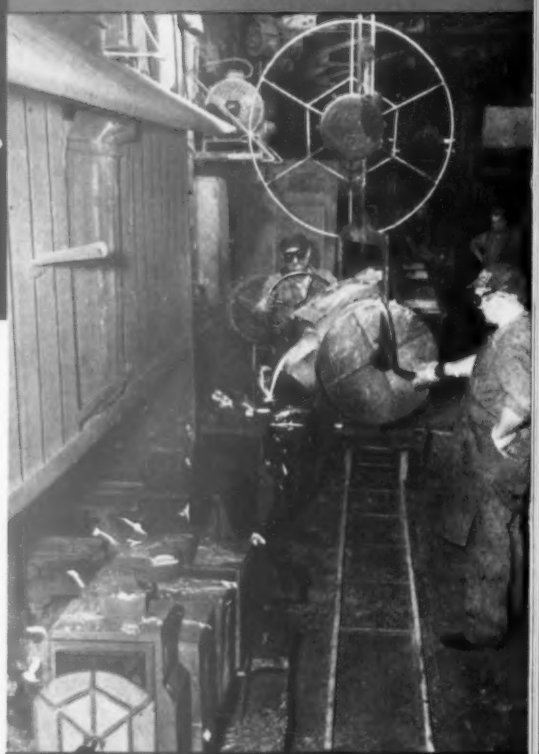


HIGHER CASTING QUALITY, INCREASED YIELD, LOWER SCRAP LOSSES

Accuracy of detail is assured with core molds. Note the smoothness of finish (for sales appeal) on both the core mold and casting — particularly on the delicate fins. Core molds bake quickly — handle safely — without danger of "dropping" or sagging. Non-hydroscopic, they can be stored indefinitely. Core molds reduce risering — hence, increase yield. Hard baked core molds resist penetration — retain accurate dimensions — are always open to close inspection.

Core Molding offers all foundries a sound and easily adopted means of increasing casting production. The accompanying pictures show how the Brillion Iron Works foundry has skillfully utilized six advantages of Core Molding to develop a highly efficient production line—mass-producing more than a thousand air-cooled cylinders daily.

Through daily contacts with hundreds of foundries . . . LINOIL core engineers are thoroughly prepared to recommend a proven remedy for your core problems. Whenever you have core troubles . . . please write us about them. We may have the money-saving answer you are seeking.



INCREASED PRODUCTION . . .
DECREASED CLEANING COSTS

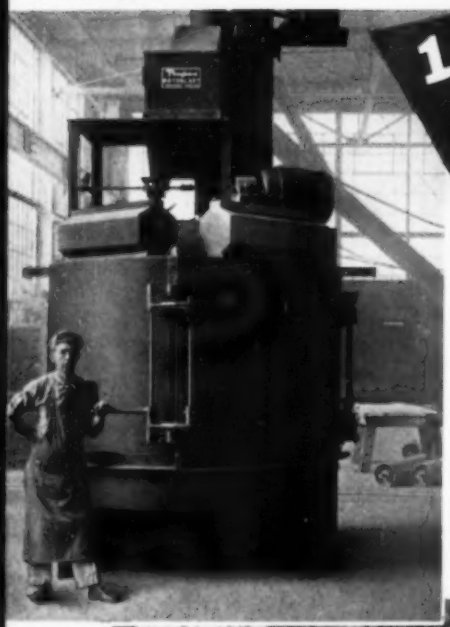
By pouring from 7 to 12 castings per "rack", Brillion reduces the number of pouring operations, speeds up casting output. Multiple (or stacked) core molding increases casting output from the same floor space. "Brick-hard" core molds are clamped tightly together (without flasks)—forming a strong, permeable mold. To the left, is Brillion's unique "cooling tunnel" for poured core molds—thus freeing the foundry of ordinary smoke and gases. Core molds shakeout faster, easier, cleaner than green sand molds.

THE LINOIL — THE LOGICAL OIL

THE WERNER G. SMITH COMPANY
(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 WEST 110th STREET • CLEVELAND 2, OHIO

2 NEW ROTOBLASTS*



1 Pangborn ROTOBLAST "TABLE-ROOM"

for all general-purpose blast cleaning jobs

With the new ROTOBLAST "Table-Room" the jobbing foundry can overcome conventional cleaning handicaps and blast clean castings as thoroughly, almost as economically, as the specialty foundry. The Pangborn "Table-Room" is your best selection for a single blast machine for all types of general-purpose blast cleaning work.

From small castings of any shape, up to heavy castings of 5000 lbs., five feet long, thirty inches high, the Pangborn ROTOBLAST "Table-Room" cleans *faster, better, cheaper.*

You don't need an experienced operator, compressed air, helmets, hoses or nozzles! The "Table-Room" takes the operator out of the blast room. All your operator has to do is put the castings on the table, close the doors, turn on the ROTOBLAST. Within a few minutes, work is cleaned down to virgin metal.

*Trademark of the Pangborn Corporation

Pangborn "Table-Room" Users Include:

- Allied Industrial Sand Blasting
- Caldwell Foundry
- California Foundries
- Champion Blower & Forge
- Clare Bros. & Co.
- Contractors Foundry
- Elliott Co.
- General Foundries
- L. Brayton Foundry
- Lewistown Foundry & Machine Co.
- Minster Machine Co.
- Snapp Foundry Co.
- Thunder Bay Mfg. Corp.
- Valley Iron Works
- Western Brass & Iron Foundry
- Westinghouse Electric Corp.

ABOVE: "Table-Room" during operation
LEFT: Doors open for loading

Pangborn

Take Operators Out of Blast Rooms

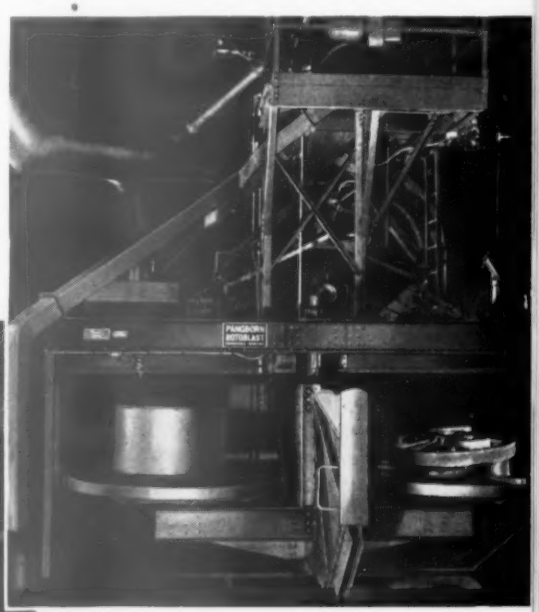
2 Pangborn ROTOBLAST "TURN-STYLE" Table

for rapid, economical cleaning of heavy castings

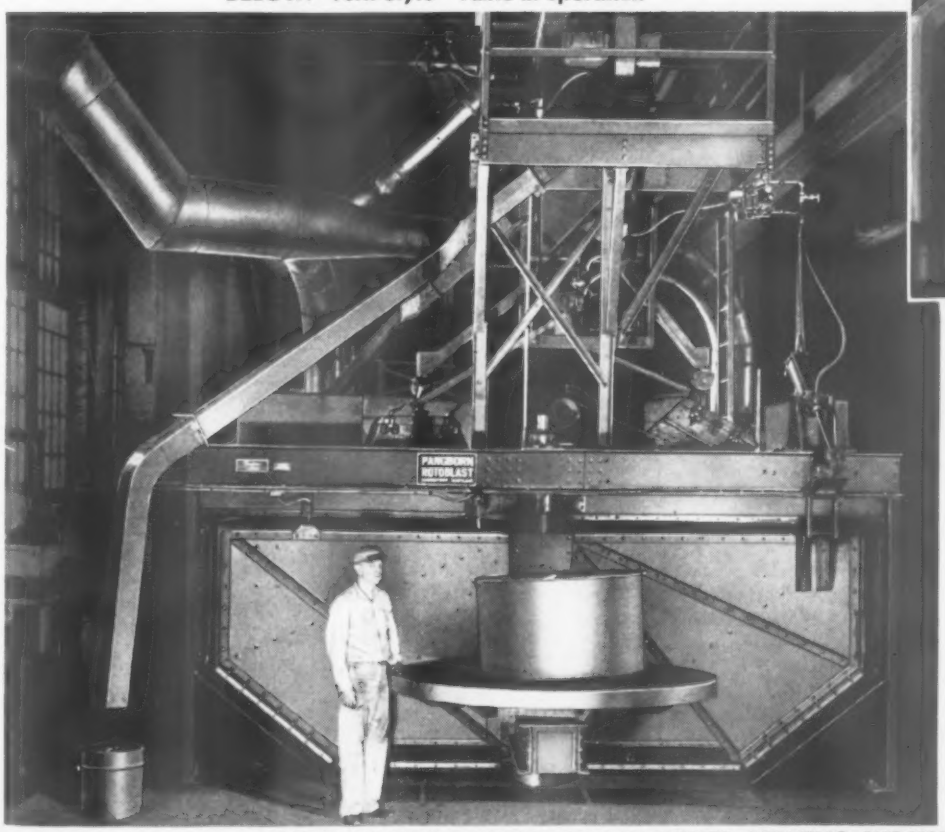
Here is Pangborn's answer to the problem of cleaning heavy, bulky castings quickly, efficiently. The Pangborn "Turn-Style" Table cleans and loads simultaneously, as one of the cleaning platforms is always inside the cabinet while the other is in loading or unloading position. The operator is always free to load, unload and turn the tables . . . he's not burdened by protective clothing or confined in the blast chamber.

Prominent users of the Pangborn ROTO-BLAST "Turn-Style" Table include General Electric, Skagit Iron and Steel Company, and Penn Steel Castings Company (where it cut a two man, eight-hour anchor cleaning job to *15 minutes with one man*). The "Turn-Style" Table is an ideal choice if you're cleaning heavy castings and want top efficiency and speed.

RIGHT: Tables half turned



BELOW: "Turn-Style" Table in operation



WRITE TODAY!

Write for complete information about Pangborn ROTO-BLAST Tables contained in the illustrated, informative Pangborn Bulletins 215 & 217. Address: PANG-BORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Md. Look to Pangborn for all the latest developments in Blast Cleaning and Dust Control.

OVER 25,000 PANGBORN MACHINES SERVING INDUSTRY

BLAST CLEANS CHEAPER

with the right equipment for every job

MEET THE NEW CHAMPION

Face t

Shake Hand ith

(MODEL CB- RE E

and see wha nak

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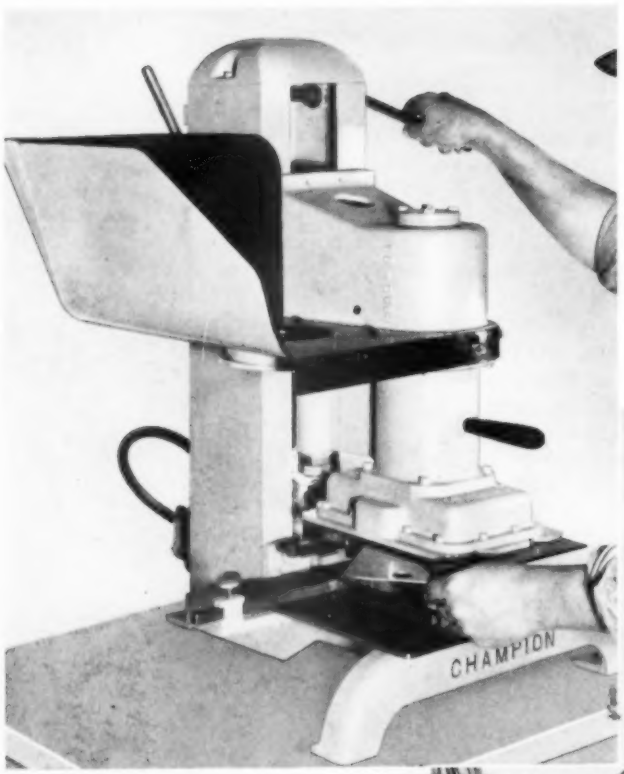
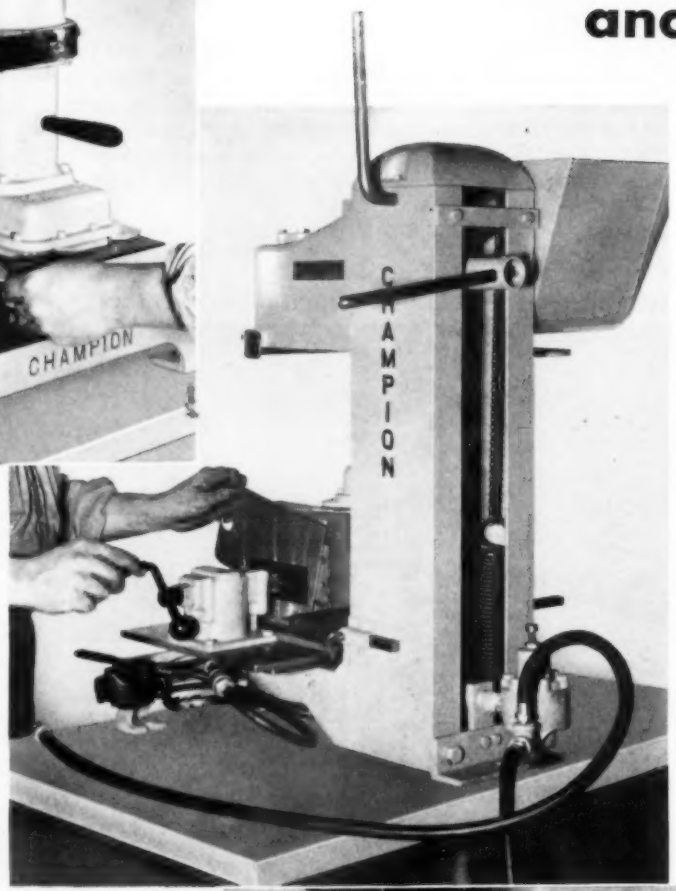




ON YOUR MARK...

To adjust the vertical clearance, place the clearance gauge on top of the core box, bring down the blow head until it touches the gauge, then tighten the clamp.

GET SET...

To adjust side clamps, place clearance gauge on the right side of core box, adjust clamp jaw by means of the hand crank. In actual operation the clamping is automatic.

NO TOOLS* NEEDED

IN SETTING UP OR ADJUSTING

One of the biggest advantages of the Champion "Junior" is the provision for rapid change over. Short runs are produced as economically as long, because getting ready is a mere matter of seconds. No screw drivers or wrenches are needed. No bolts, screws or latches need be loosened or tightened. Blow plate and base plate are removed and replaced in an instant! Box clamps are spaced to receive any box with a few quick spins of the handles.

(**Except gauge*)

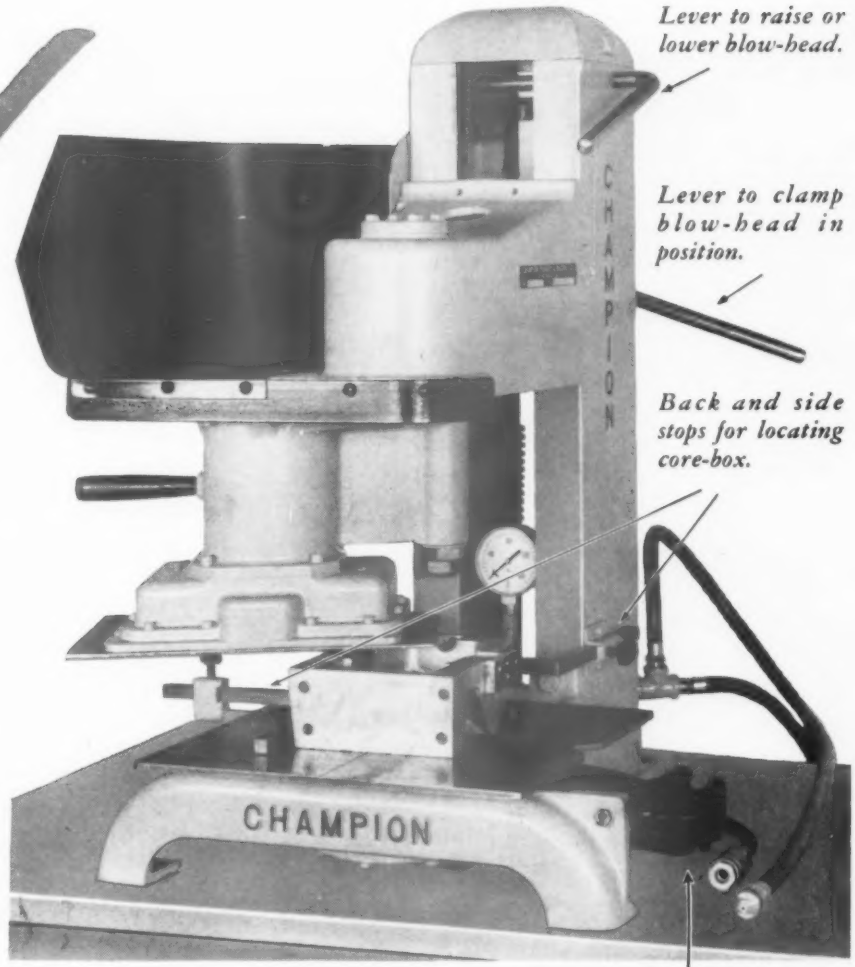
...to Face!

...nd with "JUNIOR"

CB-...RE BLOWER)

...who makes him

...A WINNER!


Lever to raise or lower blow-head.
Lever to clamp blow-head in position.
Back and side stops for locating core-box.
One air valve performs complete cycle of operations.
CHAMPION
CHAMPION

To the right is a candid, unretouched photo of the newest model Champion core blower, the CB-5. Resting on the table is an open top core box. With sand in the hopper and the air hooked up, it is ready, just as you see it, to turn out uniformly satisfactory cores as fast as you can take them away!

No extras, no separate parts, no booster needed! ***(85 pounds of air is ample pressure for any Champion.)***

...T... lamps, gauge ide of clamp of the actual clamp- c.

.....GO!

Interested in keeping costs down, quality up? Get in touch with our production specialists, let them show you how easily you can gain the benefits of the Champion method. There's a place in every modern foundry for Champion Molding Machines and Core Blowers.

The Champion CB-5 can be placed on any bench, takes up no more room than a hand core maker, multiplies one man's output tremendously. See views on opposite page indicating speed and simplicity of set-up.

Champion core-blowers, from the huge CB-400 down to the newest, the CB-5, all make use of the distinctive Champion blow valve. This feature is your guarantee of absolutely perfect cores, every time. With the safety interlock between clamping and blowing action, accidents and irregularities in performance are made impossible. The development of the "Junior" Champion extends the advantages of the Champion method to every size foundry. Even on short runs, it pays to use this machine because cores are uniform and produced at lowest cost. "Junior" requires practically no set up time and effects material economies on short as well as long runs.

For full details, write for copy of our New Bulletin.

CHAMPION FOUNDRY AND MACHINE COMPANY
GENERAL OFFICE AND PLANT, ROCKFORD, ILLINOIS
SALES OFFICE: 1513 W. MADISON ST., CHICAGO 7, ILL.

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AERO-CRANE

POWERMATIC AIR-CONTROL

No Afternoon Fatigue Let-Down

One Man, with the Powermatic Air-Control Orton Aero-Crane loads and unloads cars, trucks, gets material onto the stockpile and off with *early-morning* efficiency *all day.*

Effortless Orton air-control enables one man with the Aero-Crane to handle 200 to 1000 lb. loads that eat up the time of a yard crew. Aero-Crane pays for itself in saved man hours.

Designed to SPEED Yard Work

Orton one-man Aero-Crane travels rapidly job to job with boom in any position.

Insures SAFE lowering of heavy loads against *compression of the engine.*

Full-view cab. Full circle turntable. Anti-friction bearings. Non-burn Orcoin V-type clutches. SAFETY spring-applied, air-released hoist brakes. Electro-welded construction.

Eight models, 3,500 to 60,000 lbs. capacity. Diesel or gasoline powered.

Send for Catalog 80 for full details and roster of Orton world-wide users

◀ Long-life Orton Aero-Crane has most rigid car body of any crane built. Goes anywhere a truck will go. Operated, traveled and steered from craneman's seat.

ORTON CRANE & SHOVEL COMPANY

608 South Dearborn Street, Chicago 5, Illinois

HERE'S HOW...

LINDBERG-Fisher 2-CHAMBER INDUCTION MELTING FURNACE DOUBLES ALUMINUM DIE CASTING PRODUCTION

Floyd J. Kamin, President, Kamin Die Casting & Manufacturing Co., says: "On this job our new Lindberg-Fisher Induction Melting Furnace turns out twice as much work as a conventional gas furnace with the same melting capacity, and rejects have decreased 65%—We operate continuously, and we find that melting cost is actually less than with a gas furnace of the same melting capacity."

Edmond L. Kornayzer, Plant Supt., says: "The furnace operates much cooler and operator fatigue is practically eliminated."

. . . Reduces Rejects 65% . . . Improves Working Conditions

Kamin Die Casting & Manufacturing Co., well known Chicago manufacturers of aluminum die cast products recently installed a 2-chamber Lindberg-Fisher Induction Melting Furnace. Here's a typical Kamin job —aluminum wheels used on Pincor lawnmowers. Check this "Before and After" story of increased production and reduction of rejects.

	BEFORE —*with conventional melting equipment*	AFTER —*with Lindberg-Fisher Melting Furnace*
Production Per Hour	25-30 Wheels	50-60 Wheels
Rejects Per 100	10-15 Wheels	3-5 Wheels

A few reasons why Kamin is well satisfied with this new Furnace

- Refractory lining holds molten metal, eliminates down-time to replace broken iron crucibles or pots.
- No contamination from iron pot or thermocouple.
- Continuous operation—when cold metal is added to charging chamber there is no temperature drop in ladling chamber.
- Operator does not have to push oxide coating to one side when ladling, as impurities remain in charging chamber.
- Super-sensitive thermocouple assures extremely accurate temperature control.
- Continuous electro-magnetic fluxing assures clean metal—prevents any possible segregation of alloys.
- Absolutely no worries about freeze-up because Lindberg-Fisher Furnaces can easily be started up after power failure.

Ask for Bulletin 510, "Lindberg-Fisher 2-Chamber Induction Furnaces for Melting and Holding"

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2453 West Hubbard Street, Chicago 12, Illinois

IT'S *New*... IT'S *Different*...

DELTA BLAKOAT S5

CORE AND MOLD WASH

Delta Blakoat S-5 Core and Mold Wash, for grey iron castings, is a product of scientific research, conducted by Delta Foundry Research Laboratory in cooperation with one of the leading grey iron foundries in the mid-west. It's development solves critical difficulties, inherent in grey iron casting, which have persistently plagued foundrymen and foundry technicians.

Delta Blakoat S-5 is a distinctly new and different wash. It provides all of the well-known advantages of other Delta Core and Mold Washes plus the added advantages listed on the right.

Write for complete information. If you wish it we will send a liberal working sample to you for test purposes in your foundry.

IT'S *New*... IT'S *Different*...

1. It's new and different. It has qualities and characteristics contained in no other wash. It substantially reduces cleaning room costs and greatly improves casting finish.

2. It produces results, on grey iron castings, unequalled by any other wash. It will not deform cores. Edges and corners remain clean and sharp.

3. It costs less to buy and is considerably more economical because you use it at a lower Baume.

4. It can't flake or peel because it anchors itself by penetrating onto the sub-surface sand grains of cores and molds. It greatly increases the surface hot strength of the sand which prevents veining and metal penetration.

5. It is easily applied and adheres to any sand surface . . . green or dry . . . and produces a smooth, highly refractory, waterproof surface over which molten metal flows faster and without interruption.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

There's no grinding job too tough for NEW Heavy Duty SKIL Grinder

New Heavy Duty SKIL Grinder makes light work of roughest, toughest foundry jobs. It's super-powered with a 3-phase, 220-volt motor for continuous heavy-duty wire brushing, sanding and grinding. It's built to take plenty of hardest wear. It's designed to deliver maximum speed under heavy load. Ask your SKIL Tool Distributor to demonstrate Model "320" SKIL Grinder *today!*

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Factory Branches in Principal Cities
In Canada: SKILTOOLS, LTD., 66 Portland St., Toronto, Ont.

SKIL ELECTRIC Tools PNEUMATIC
TRADE MARK

COLEMAN OVENS

Read what John M. Price, president of one of the nation's largest and most successful automotive jobbing foundries writes about Coleman Ovens.

FERRO MACHINE & FOUNDRY INC.

MANUFACTURERS OF
PRODUCTION MACHINE SHOP AND TOOL ROOM — FERRO — GREY IRON CASTINGS FOR AUTOMOTIVE INDUSTRY

3155 EAST 66TH STREET
CLEVELAND, OHIO

August 31, 1948

The Foundry Equipment Company
1831 Columbus Road, N. W.
Cleveland 13, Ohio

Gentlemen:

Recently we hit some new production highs and would like to tell you that our Coleman Ovens have played a very important part in helping us turn out tonnages which a few years ago might have seemed impossible.

Our Coleman Tower Ovens have enabled us to double our production without adding a square foot of floor space to our core departments.

We have been using various types of Coleman Ovens since 1905. While we would rather not quote specific savings, we can tell you that our very large investment in Coleman Tower Ovens since 1944 is one of the most profitable equipment purchases we have ever made.

As one of the largest automotive jobbing foundries in the industry, we produce a type of work that requires many complex and delicate cores. Our Tower Ovens have proved to be unusually flexible, enabling us to turn out the large variety of cores we need with perfect results. Tremendously improved working conditions have enabled us to attract and hold better workers.

We are pleased to recommend Coleman Ovens and your company without reservation.

Sincerely

FERRO MACHINE & FOUNDRY, INC.

John M. Price
President

For lowest cost operation, whether your core production is as large as Ferro's or of a limited nature, it will pay you to investigate Coleman Ovens. Write today for Bulletin 48 which describes all types and sizes of Coleman Ovens.

The FOUNDRY EQUIPMENT CO

CLEVELAND 13, OHIO, U. S. A.

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALIST

double production
for FERRO MACHINE & FOUNDRY INC.

This Coleman Tower Oven at Ferro is one of the world's largest. It bakes 18,000 lbs. of cores per hour.

Coleman Tower Oven baking Ford V-8 Cylinder Head Cores at Ferro. Load second floor, unload first floor.

Feeder Conveyor serves one of several Coleman Tower Ovens in another Ferro core department.

Showing part of one of Ferro's highly mechanized core departments served by a battery of Coleman Tower Ovens.

One of Ferro's many Coleman Horizontal Conveyor Blacking and Paste Drying Ovens.

OTHER LARGE USERS OF COLEMAN OVENS PRODUCING AUTOMOTIVE, TRACTOR, AND FARM MACHINERY CASTINGS

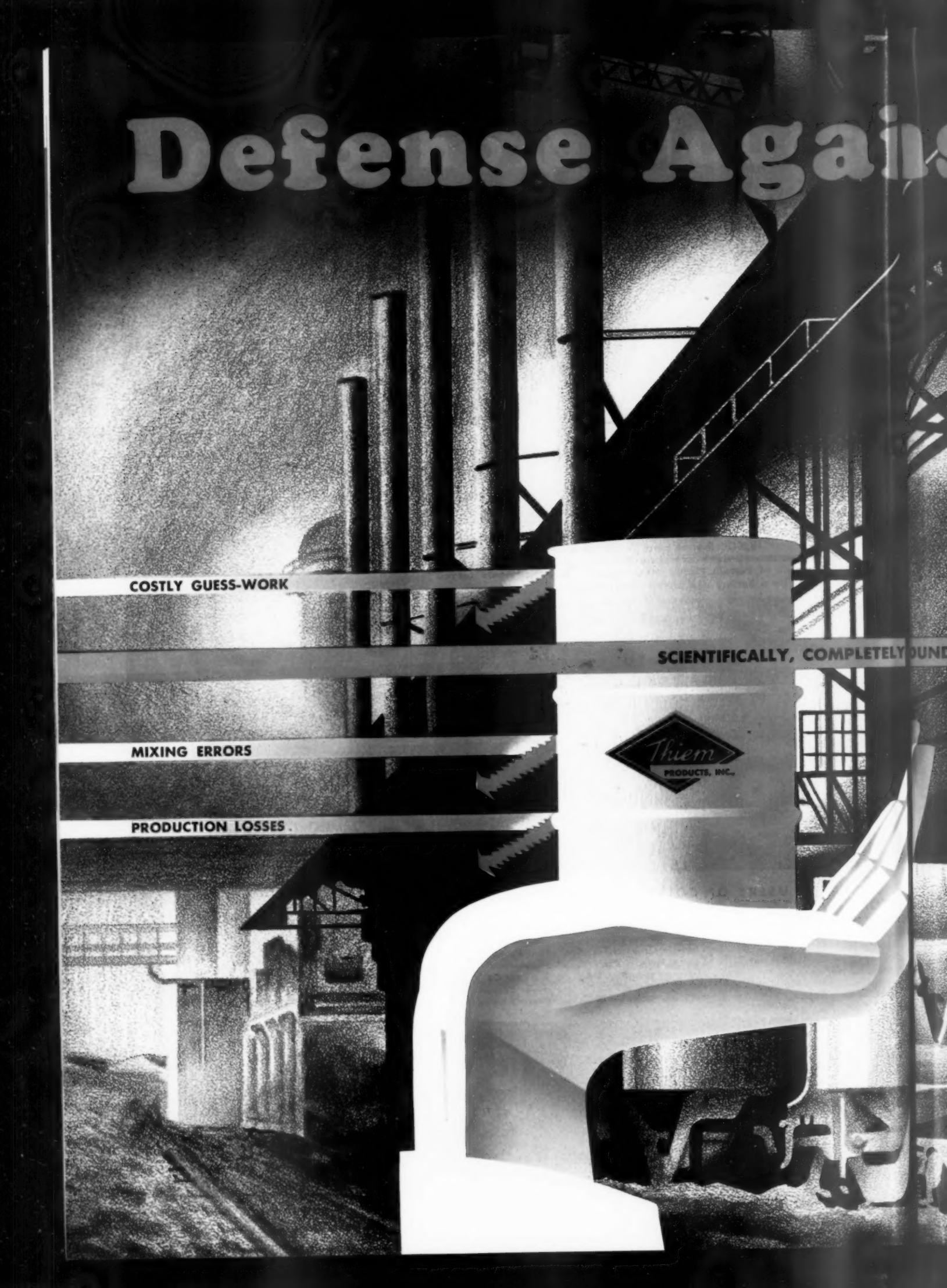
Campbell, Wyant & Cannon Fdry. Co.
Wilson Foundry & Machine Co.
Lynchburg Foundry Co.
Lakey Foundry & Machine Co., Inc.
International Harvester Co.
Minneapolis-Moline Power Imp. Co.
Studebaker Corporation
General Motors Corporation
Cadillac Foundry Div.
Chevrolet Grey Iron Fdry. Div.
Central Foundry Div.
McKinnon Industries, Ltd.
Pontiac Foundry Div.
Saginaw Malleable Div.
American Foundry Co.
Standard Foundry Co.
Ford Motor Co., Ltd.
Massey-Harris Co.
J. I. Case Co.
Oliver Corporation
Deere & Company

N COMPANY
BUILDERS OF COLEMAN
S. AND SWARTWOUT OVENS

MEMBER
MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

COLEMAN
CORE AND MOLD OVENS

LIST OVER 9000 SUCCESSFUL INSTALLATIONS


Defense Agai
COSTLY GUESS-WORK
SCIENTIFICALLY, COMPLETELY
MIXING ERRORS
PRODUCTION LOSSES
Thiem
PRODUCTS, INC.

...ist Errors!

• To err is human — but costly errors have no place in your foundry operations. One mistake in mixing can cause you heavy losses in material costs and production stoppages.

Thiem products are *finished products.* High refractory plastic washes in paste form, they require no special skill in mixing. Scientifically, *completely* compounded, they eliminate the human element of error — and the heavy production losses that go with it.

THIEM

Specify Thiem products for your core wash and mold coating problems. All Thiem products are laboratory controlled, completely compounded — *and sold with service!*

Thiem

PRODUCTS, INC., MILWAUKEE 4, WISCONSIN

Manufacturers of Foundry Products Exclusively

KROME KOTE • FERRO KOTE • MOLD LITE • INGOT KOTE • NODRI MOLD SPRAY • FERRO-GLAZE FLUX • CHILL KOTE • SYNOL • CORE-BINDERS

MODERN FOUNDRY PRODUCTION METHODS CALL FOR

STACK MOLDING WITH STERLINGS

You can increase your foundry production now by stack-molding with Sterling Steel Flasks. This modern method of molding makes your foundry more efficient through greater job specialization, saves valuable floor space. Molds are made in flask sections stacked one above another, to a height of 10 to 12 sections, the exact number depending upon the depth of each section.

Sterling Steel Flasks are designed and built to withstand the tremendous pressure used by high-speed molding machines. They retain their rigidity and accuracy under constant production pressure. All types and sizes available to meet your requirements.

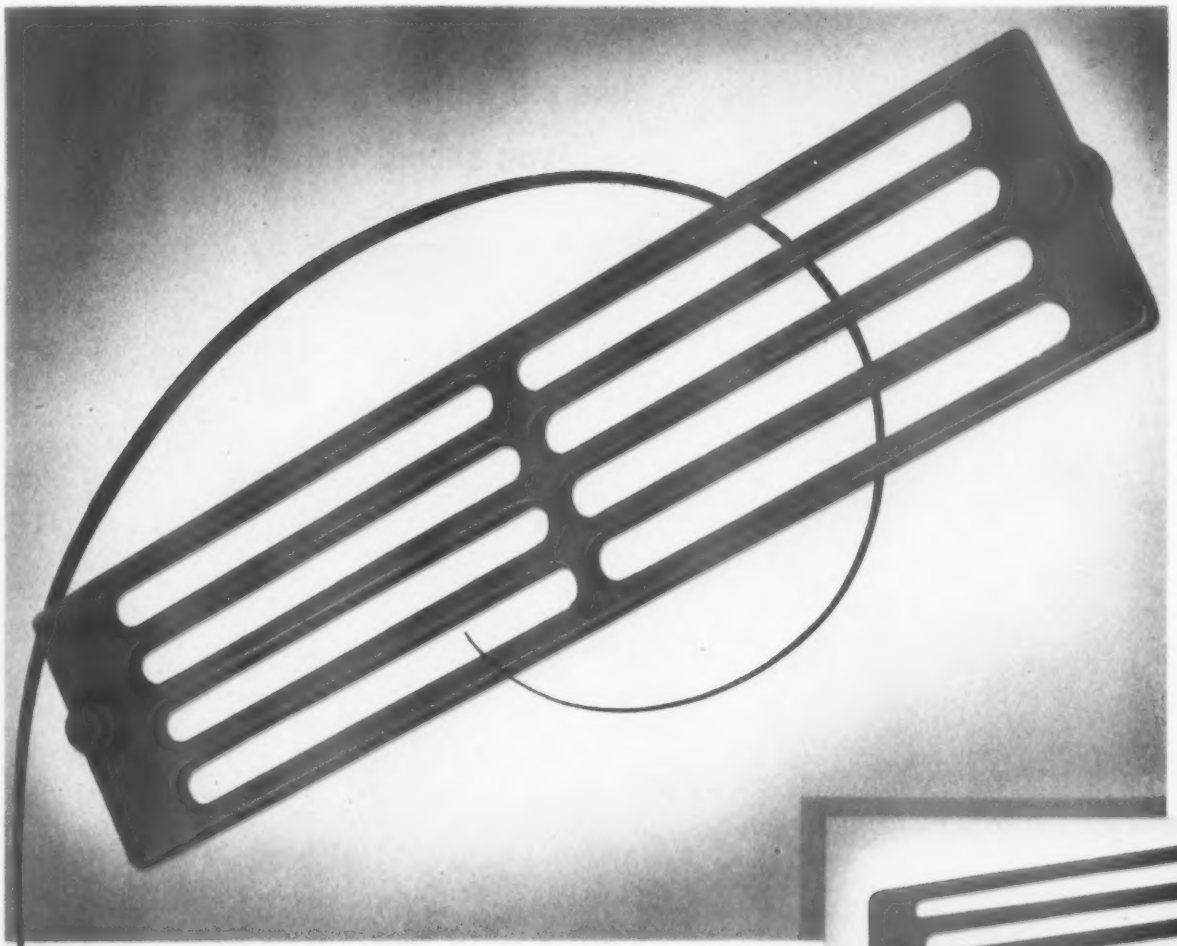
For faster, more efficient molding use Sterling's sturdy *rolled steel channel flasks.*

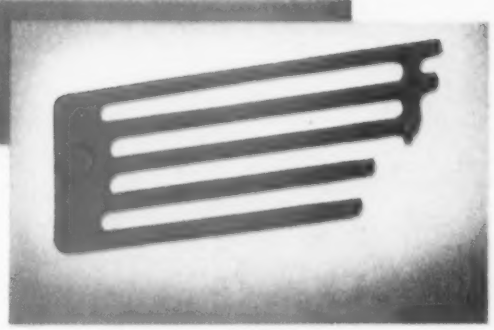
MORE THAN 4000 FOUNDRIES USE STERLING FOUNDRY EQUIPMENT

Sterling FOUNDRY FLASKS

STERLING WHEELBARROW COMPANY • Milwaukee 14, Wis., U.S.A.

A 5358-1F





No rods or wires

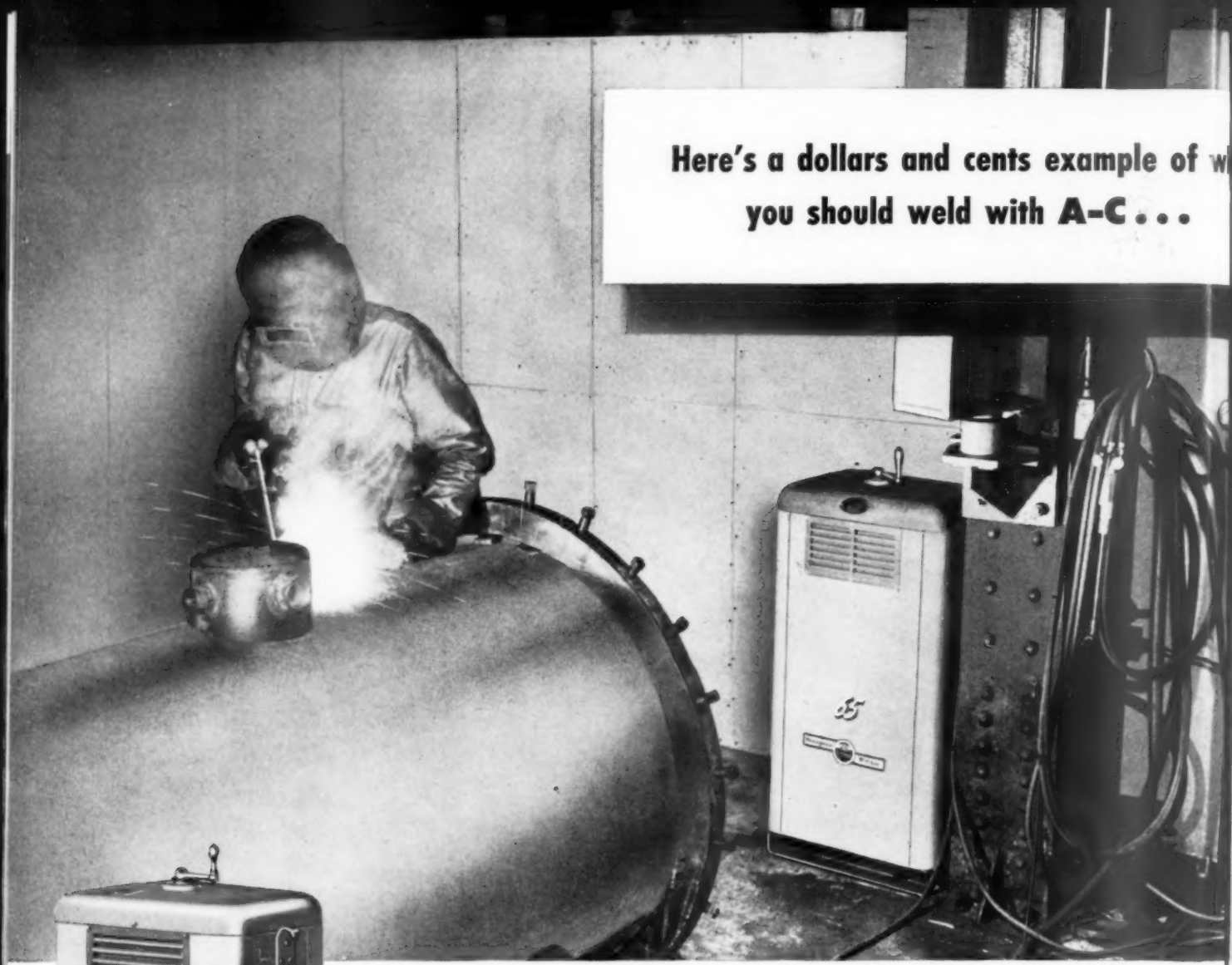
Are you looking for a TOUGHER Core Oil?

FOUNDRYMEN know that radiator cores are a real test for toughness in core oil. Made without rods or wires, they go through the oven on inset driers, must be knocked loose while hot without cracking, and be cooled at an angle without sagging. For the hard-to-handle job . . . the job that involves conditions pointed out above . . . the toughest and most effective core oil is KORBOND. To prove this, five of the larger radiator plants are consistent users of KORBOND. Try it on your next tough job.

KORBOND
Core Oil
No. 801

UNITED OIL MFG. CO.

1429 WALNUT STREET • ERIE, PA.



Here's a dollars and cents example of w
you should weld with A-C . . .

FLEXARC ELECTRODES AND FLEXARC WELDERS

. . . THE IDEAL OPERATING TEAM

Westinghouse Flexarc Electrodes work especially well with the new power-saving, low-voltage Flexarc "65" Industrial A-C Welders. Typical of the increasing use of this cost-saving team is this application at Worthington Pump Company, Harrison, N. J.

The Flexarc "65" provides the most advanced design of industrial a-c welders—built to operate with an open-circuit secondary voltage of only 65 volts. It overcomes the problems of arc instability which formerly limited the use of lower voltages for heavy-duty industrial welding.

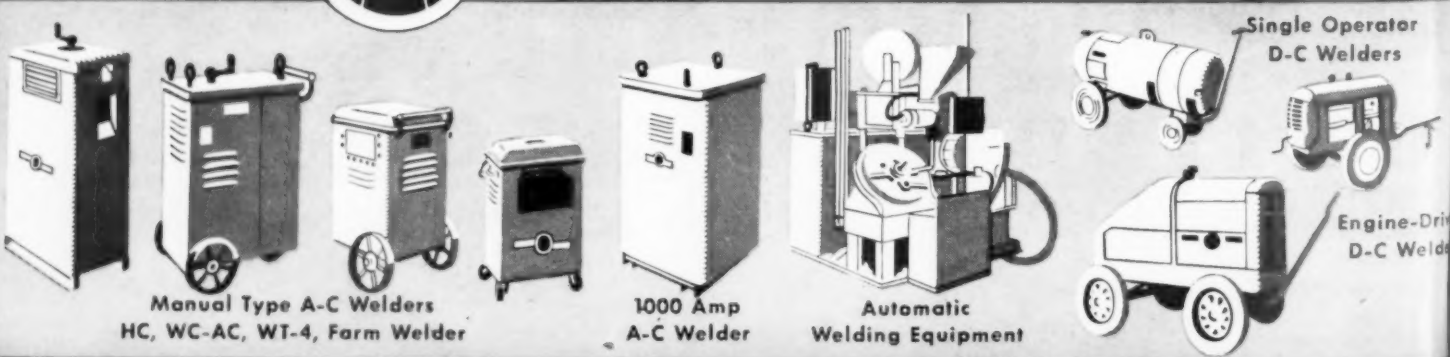
Available in 200, 300, 400, 500 and 600-ampere ratings. Ask for complete information on these and other Westinghouse A-C Welders up to 2,000 amperes in size.

FOR SUPERIOR WELDING FLEXARC

WESTINGHOUSE

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



Manual Type A-C Welders
HC, WC-AC, WT-4, Farm Welder

1000 Amp
A-C Welder

Automatic
Welding Equipment

MODERN A-C WELDING WILL BRING YOU SAVINGS

... EQUAL TO THE COST OF YOUR ELECTRODES!

Do you know how much your electrodes cost you? It's a tidy sum. If you are now welding with d-c, you can save the equivalent of that cost . . . or more . . . simply by using modern, more efficient a-c welding techniques and equipment.

Actual operating figures prove that a-c welding is *faster . . . better . . . cheaper.* They show a-c welding to be 20% to 30% faster, providing savings in labor . . . that electrical efficiency is 85% to 90% for a-c compared to 55% to 65% for d-c, providing savings in power . . . that depreciation and maintenance costs are substantially reduced.

A Westinghouse welding specialist is ready to show you the savings you can make. Call your near-by Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

WESTINGHOUSE FLEXARC ELECTRODES . . . FIRST FOR A-C WELDING

For a-c welding of any type . . . for high-quality welds at high-production speeds . . . you can be sure of results with Flexarc Electrodes. They were the first to make a-c welding practical, opening the way to today's increasing acceptance of this faster, better, cheaper method.

Each Flexarc Electrode has definite characteristics for specific welding requirements . . . developed and perfected by Westinghouse for easy arc control, easy metal deposition and sound, attractive finished welds. Immediate delivery . . . in any quantity . . . on most types.

J-21450

A FLEXARC ELECTRODE FOR EVERY NEED...

the most complete line on the market today

for Mild Steel—6 popular types

for Cast Iron—machinable and non-machinable types

for Low Alloy Steels—3 types, for cast steel and high tensile rolled steel

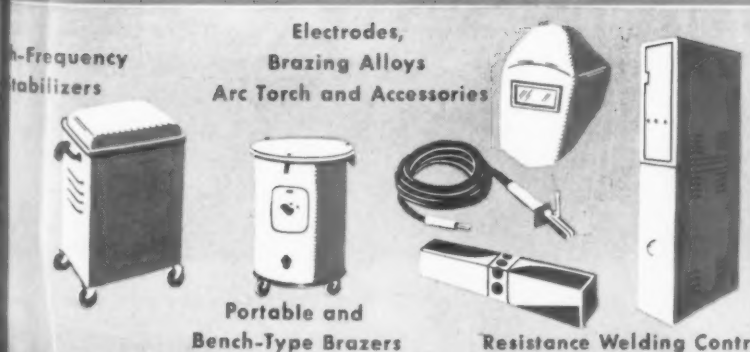
for Stainless Steels—27 types to meet particular needs

for Hard Surfacing—10 different electrodes for various requirements

and

the New Flexarc Electrode which eliminates "underbead cracking"

EVERYTHING for Welding ANYTHING!



MAIL THIS COUPON

WESTINGHOUSE ELECTRIC CORPORATION
P. O. BOX 868, Pittsburgh 30, Penna.

YES—send me details on the new Westinghouse "65" A-C Welder—also on items checked.

- ☐ Automatic Welding Equipment
- ☐ Engine-driven Welders
- ☐ HF Stabilizers
- ☐ Brazers
- ☐ Electrodes
- ☐ Resistance Welding Control
- ☐ D-C Welders

Name _____

Company _____

Address _____

The heart of every casting is the pattern...so it has to be "accurate"

The ACCURATE MATCH PLATE COMPANY is a specialized organization with the ability to meet your requirements accurately.

We are foremost in the manufacture of pressure cast match plates, both as to quality and quantity.

Our plant is a modern building, housing specialized equipment and highly skilled artisans under able supervision.

We manufacture the following types of PRESSURE CAST EQUIPMENT from Plaster Molds:

Aluminum MATCH PLATES, COPE AND DRAG SETS,
CORE BOX CASTINGS, and white metal and aluminum
PATTERN CASTINGS.

Aluminum cast under pressure in plaster molds insures accurate dimensions, adherence to detail and smooth surfaces.

DESCRIPTIVE BROCHURE UPON REQUEST

QUICK DELIVERY BY RAIL EXPRESS OR AIR FREIGHT

Pick-up and delivery by jobber representatives in the following areas:

MILWAUKEE, WIS.
John M. Donohue
Bluemound 8-8989

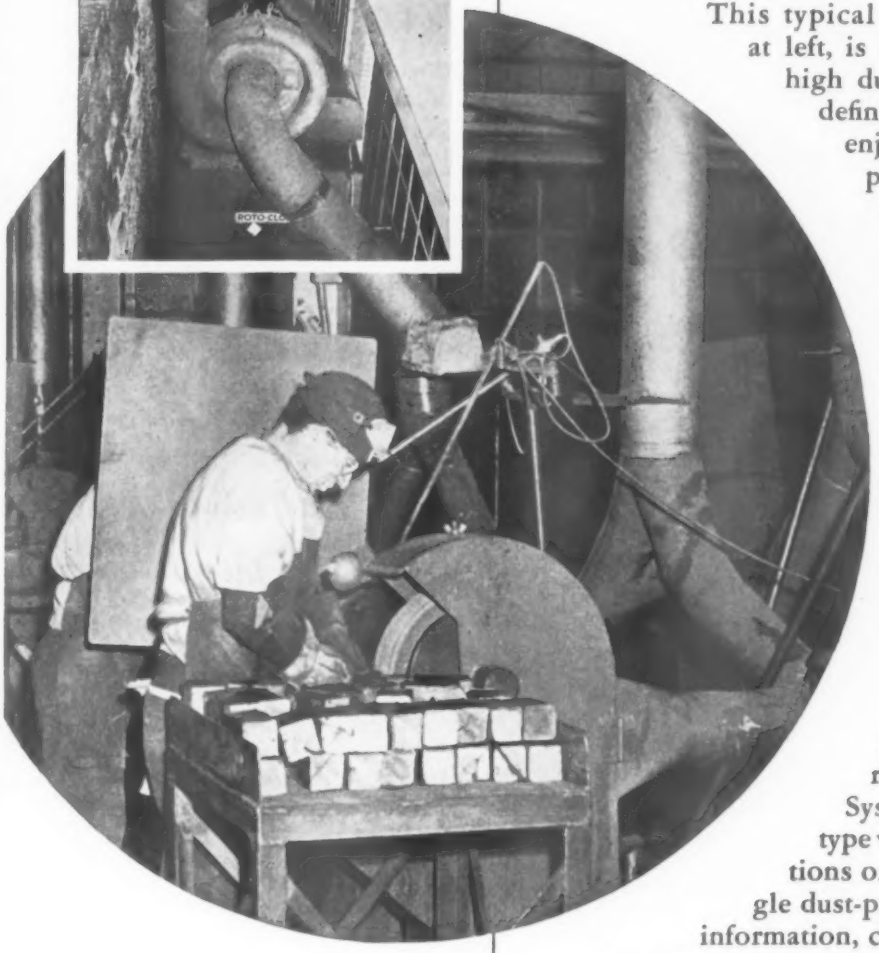
WORCESTER, MASS.
Henry A. Kottmann
Auburn 2683

LOS ANGELES, CAL.
McGowan Company, Inc.
TRinity 2057

NORMAL, ILL.
Clarence C. Schmidlin
Normal 8743-1

ACCURATE MATCH PLATE COMPANY
1847-51 W. CARROLL AVE., CHICAGO 12, ILL.
TELEPHONES: SEeley 3-7918, 3-7919

There's always room for a ROTO-CLONE



WHERE there's a will to practice dust control, there's a way to fit Roto-Clone* into your present production set-up. And here's an installation that proves the point.

This typical grinding department, pictured at left, is engaged in snagging forgings—a high dust-producing operation. Space is definitely at a premium, yet the workers enjoy the full benefits of Roto-Clone's positive dust control. Hoods and ducts are all you see. The four Type D units, shown above, which serve these grinders are installed in a light well just outside the building—out of the way but always on the job.

The Type D Roto-Clone combines the functions of exhauster and separator in a compact, self-contained unit. All operations—drawing in the dust-laden air, separation of dust, delivery of collected material to storage hopper and expelling the clean air—are performed by one moving part.

And remember—there's always room for a Type D Roto-Clone System. It may be installed as a central type with main duct and branch connections or as individual units serving a single dust-producing operation. For complete information, call your local AAF representative or write direct to—

MEMBER
MANUFACTURERS ASSOCIATION FOUNDRY EQUIPMENT

AMERICAN AIR FILTER COMPANY, INC.
266 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

**Roto-Clone is the trade mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

MOLDED TO PERFECTION!

THE "REASON WHY" BACK OF

Smith L-O Core Oil

With 20 distinct grades of Smith L-O Core Oil to select from, it is possible to choose the oil that works best with the type of sand you use. Let our practical foundry service men recommend the grade best suited to meet your particular requirements.

Your metallurgists and our chemical engineers have at least one virtue in common. They pay meticulous attention to *every detail* when pursuing their chosen work. If you trust implicitly the fine job your metallurgists are doing, likewise you can put great faith in the chemists responsible for the quality and uniformity of Smith L-O Core Oil.*

In addition to their natural flair for compounding — and their ability to eliminate variables when testing — our chemists are further aided by the finest, most modern laboratory and production equipment available. The end result of these combined factors is your complete assurance of receiving graded core oil that meets your most exacting specifications.

**The only core oil processed by the Dow-Therm method of indirect heat treatment.*

Smith L-O Core Oil

WAREHOUSE STOCKS AVAILABLE
In The Following Cities

- COLUMBIAN WAREHOUSE CO. — Reading, Pennsylvania
- FOUNDRY SERVICE CO. — Birmingham, Alabama
- E. R. FROST CO. — Minneapolis, Minnesota
- MARKET TERMINAL WAREHOUSE — Buffalo 4, New York
- MALCOLM G. STEVENS — Arlington, Massachusetts
- TERMINAL WAREHOUSE — Worcester 8, Massachusetts
- TOMKINS TIDEWATER TERMINAL — South Kearny, New Jersey
- M. W. WARREN COKE CO. — St. Louis, Mo.
- WESTERN FOUNDRY SAND CO. — Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. — Portland 14, Oregon

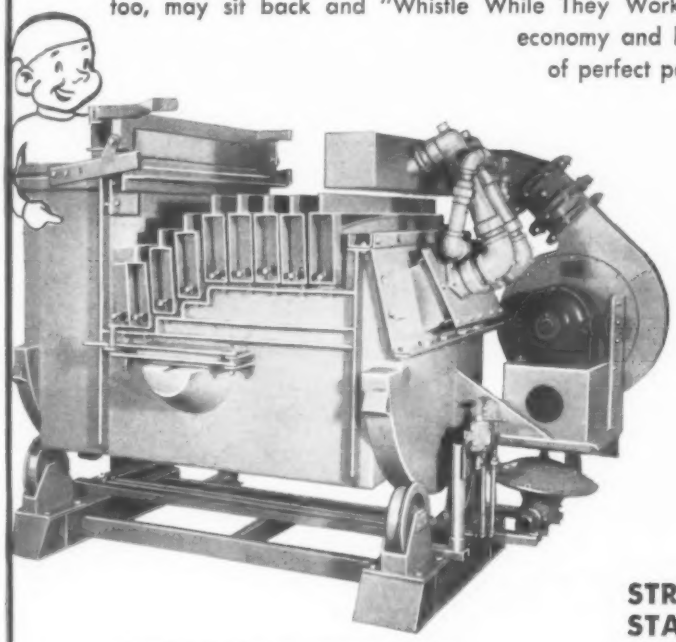
Smith L-O Core Oil

CORE WASH ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS

YOU can whistle . . . while THEY work!

Here are a few furnaces that are now being used by many of the leading organizations in the foundry, die casting and permanent mold industries throughout this country of ours. They have done their respective jobs well! The fact is, when you install a Stroman Furnace for any non-ferrous metal melting job, you too, may sit back and "Whistle While They Work," for their efficiency, economy and longevity are your assurance of perfect pours, every time, at lowest costs.

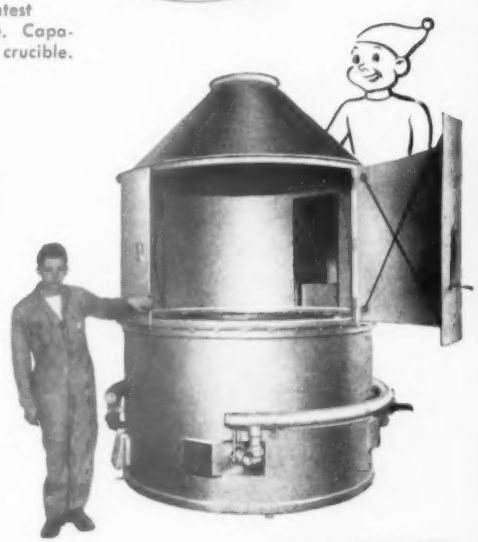


ECONOMELT FURNACES

The Best Direct Fired Reverberatory Melting Furnace on the market! Its speed in melting Brass, Bronze, Grey Iron or Aluminum is unmatched! Continuous charging . . . with cold metal never reaching the molten bath, makes it practically a continuous pour furnace . . . and it will show upwards of 40% in fuel cost savings. Oil or gas fire. Also can be furnished with combination oil, gas burner. Capacities (Brass) up to 2000 lbs. Write for Bulletin No. 635 for full information.

STROMAN CRUCIBLE STATIONARY MELTING FURNACES

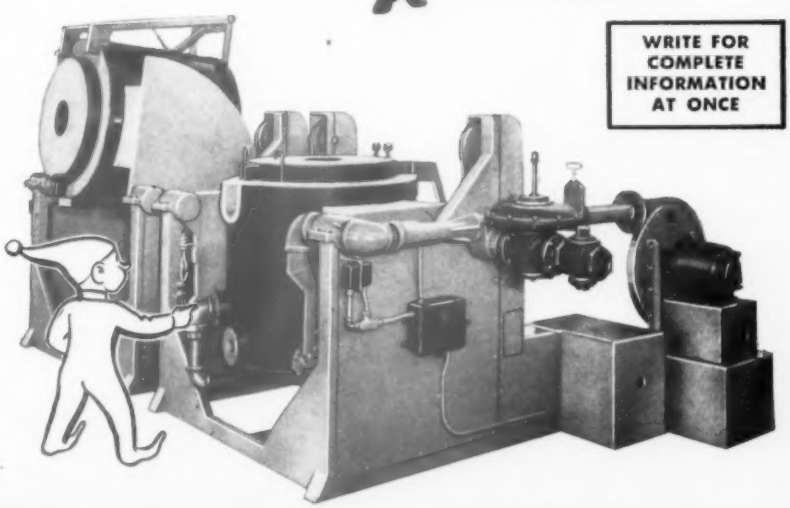
For Brass, Bronze, Aluminum and other non-ferrous metals. Sturdy, efficient and featuring the Stroman Push-Back Cover these stationary furnaces are designed for peak production and greatest fuel economy. Oil or Gas Fire. Capacities from No. 20 to No. 400 crucible.



STROMAN IRON POT STATIONARY MELTING FURNACES

These furnaces are highly recommended as break down furnaces for zinc die casting plants. They also excel as aluminum holding furnaces. They can be supplied with or without hoods to exhaust fumes and heat. Their construction assures longest pot life and lowest fuel costs. Choice of manual or automatic controls and gas or oil fire. Capacities from 212 to 14,000 lbs. of zinc.

WRITE FOR COMPLETE INFORMATION AT ONCE



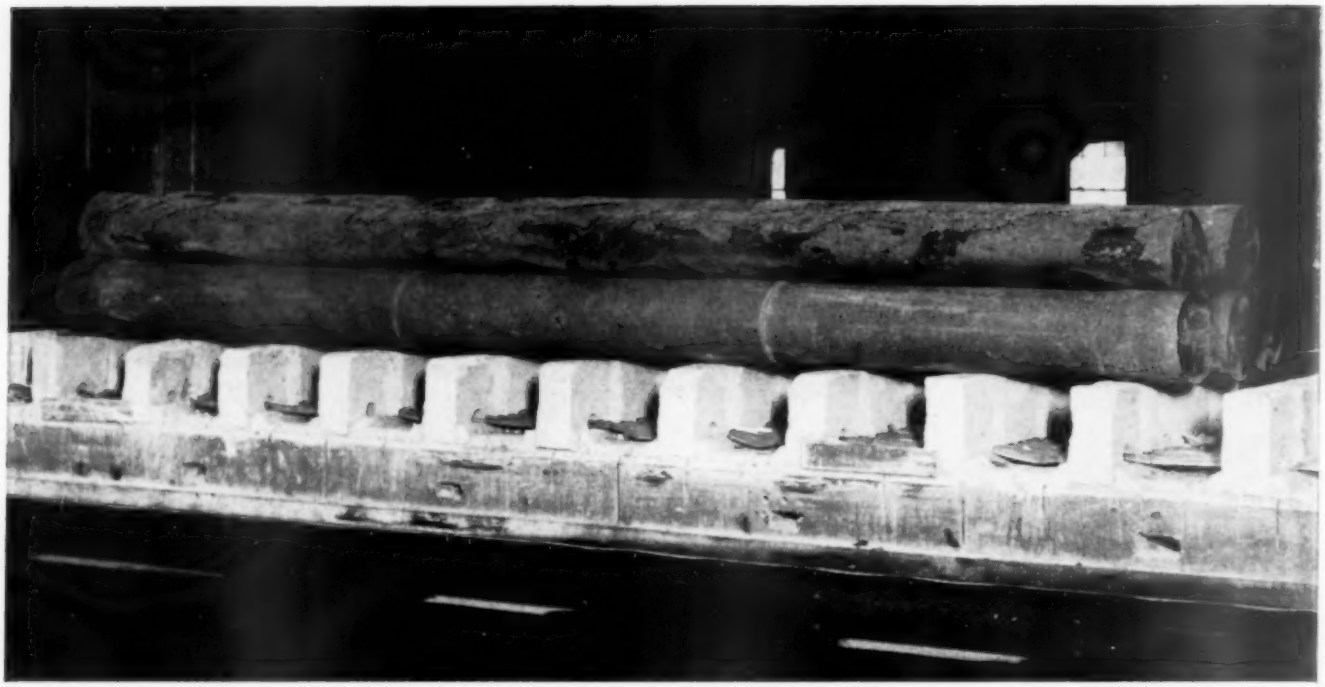
STROMAN MECHANICAL OR HYDRAULIC TILT CRUCIBLE MELTING FURNACES

For Brass, Bronze, Aluminum and other non-ferrous metals. Stationary Lip Pour assures a constant pouring arc, eliminating the necessity of moving the ladle at any time during a pour. They are excellent for use in permanent mold and die casting plants as well as any foundry. Their sturdy construction assures longest life, and their economical operation results in lowest production costs. Oil or gas fire. Built in sizes to handle capacities from No. 125 to No. 400 crucible.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.



The above unretouched furnace view illustrates the marked difference between the heat-resistant properties of alloy annealing tubing, bottom, and iron tubing, top. Note the highly scaled condition of the latter, though it has been in use less than one-tenth as long.

HOW THE PRESSED STEEL CO. *Light-Weight* UNITS

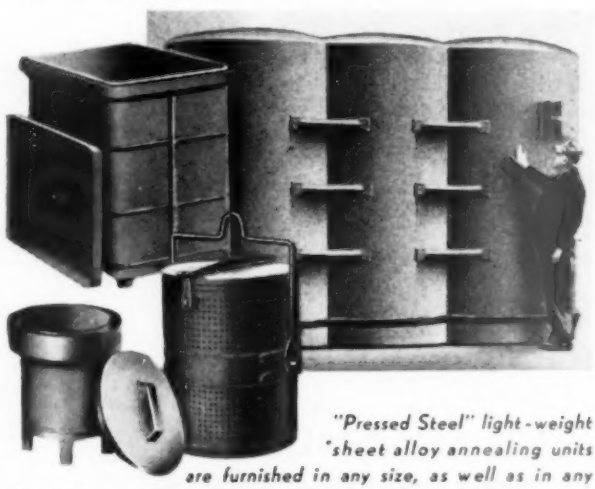
Triple the Life OF ANNEALING EQUIPMENT

After 25,000 hours of service, the welded alloy annealing tubes, bottom tier on car above, are still in good condition. Although less than 1/10th as long in service, the steel tubes in the top tier are nearing the discard stage of deterioration. Records of some annealing furnaces show that these "Pressed Steel" alloy tubes had over 30 times the life of steel pipe. These impressive life/cost ratios result from the fact that all types of "Pressed Steel" annealing equipment, from the smallest box or tube to the largest cover, are made of sheet alloy of the metal specification best suited to meet the specific temperature problem.

Weigh Up to ⅔ Less. Save Time & Fuel

By cutting as much as 2/3 off the weight of annealing equipment, "Pressed Steel" units offer these three additional advantages:

1) FUEL SAVING--Need less to attain pot heat.
2) LABOR SAVING--Handle easier and faster.
3) SPACE SAVING--Being less bulky, installations have at times doubled furnace capacity.

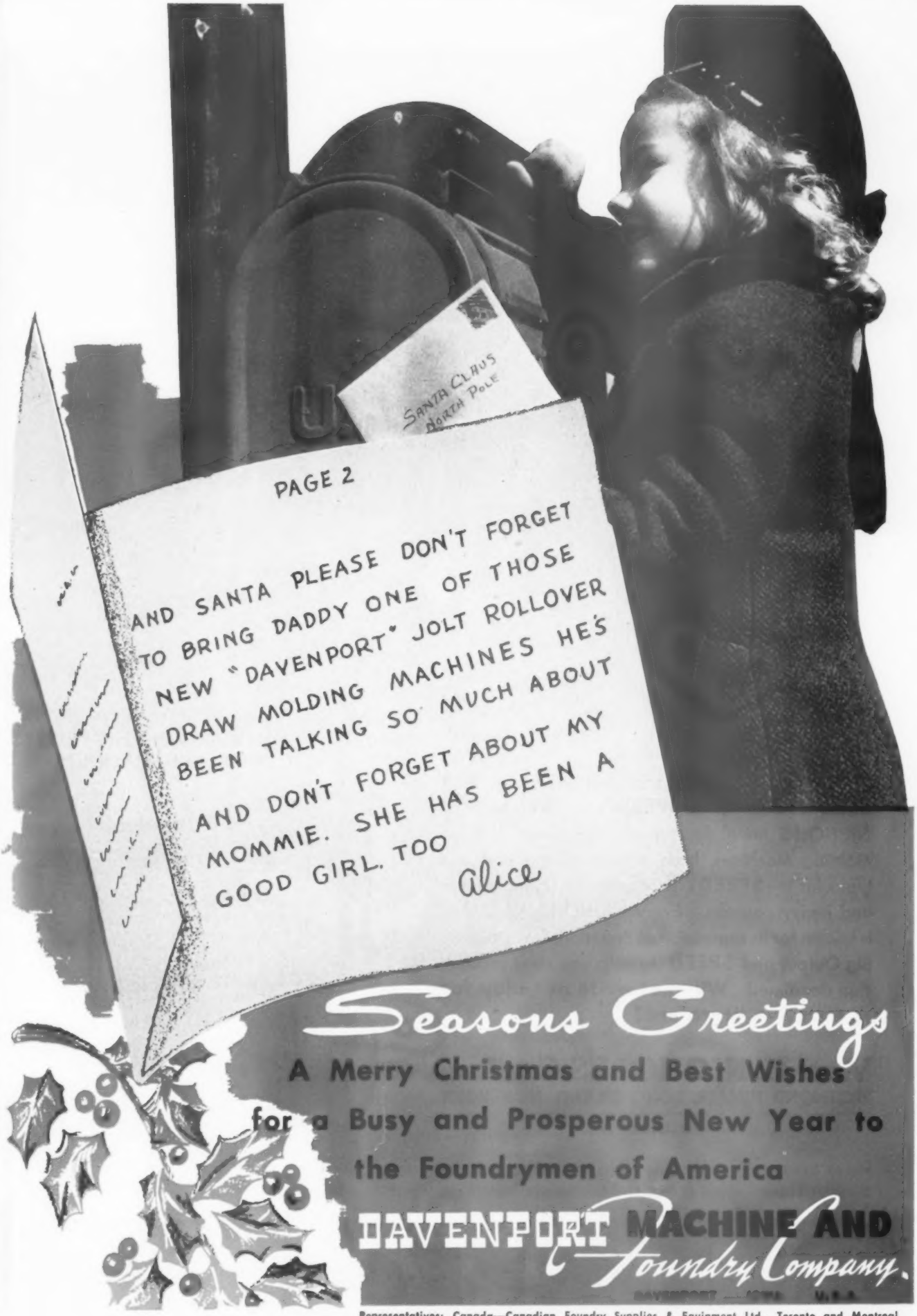


"Pressed Steel" light-weight sheet alloy annealing units are furnished in any size, as well as in any design or metal specification. Complete line of heat-treating equipment: annealing and carburizing boxes, covers, baskets, racks, tubes, retorts, etc.

THE PRESSED STEEL COMPANY
of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆



Seasons Greetings

A Merry Christmas and Best Wishes for a Busy and Prosperous New Year to the Foundrymen of America

DAVENPORT MACHINE AND Foundry Company.

Representatives: Canada—Canadian Foundry Supplies & Equipment Ltd., Toronto and Montreal France, Holland, Belgium, Luxemborg, Switzerland—Ph. Bonvillain & E. Ronceray, Choisy-Le-Roi, Rue Paul Carle, Seine, France. All other foreign countries—R. K. Price Associates, Inc., 70 Pine Street, New York 5, New York, U. S. A.

Foundry men all agree that there is **"NO SUBSTITUTE FOR SPEED".** We, here at NICHOLLS have developed a complete line of Molding Machines, both stationary and portable types for the **SPEEDY** production of light, medium and heavy castings. Every NICHOLLS MACHINE is known for its reputation of Precision, Low Upkeep, Big Output and **SPEED** to help you meet production deadlines! **Why not write us today for descriptive literature?**

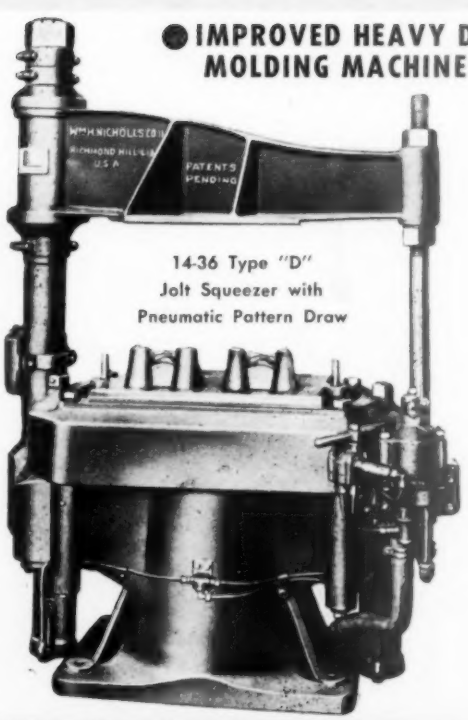
Wm. H. NICHOLLS Co., Inc.

RICHMOND HILL 18, LONG ISLAND, NEW YORK

ESTABLISHED 1910

FOREIGN MANUFACTURERS AND SELLING AGENTS FOR CONTINENTAL EUROPE AND GREAT BRITAIN — GEORGE FISCHER, LTD., SCHAFFHAUSEN, SWITZERLAND

● IMPROVED HEAVY DUTY MOLDING MACHINES

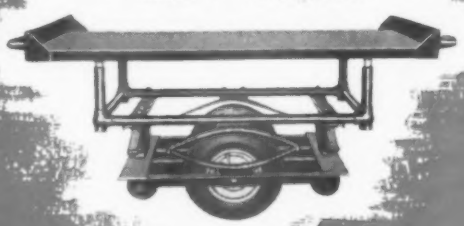


14-36 Type "D"
Jolt Squeezer with
Pneumatic Pattern Draw

NICHOLLS

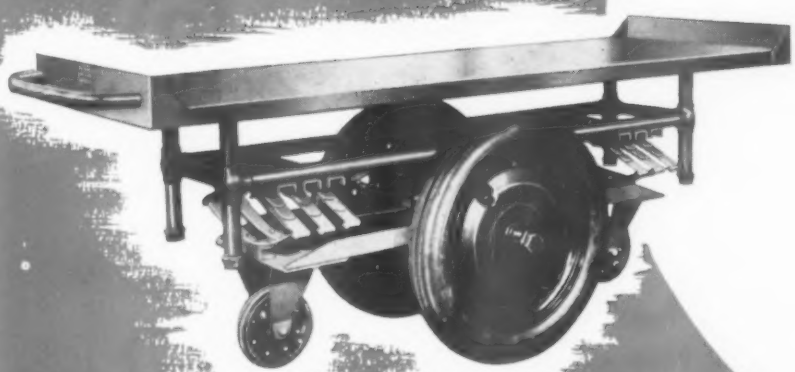
ACCLAIMED! APPROVED! ACCEPTED!

MODEL B-1
Intermediate elliptical springs provide extra cushioning protection. Load capacity, 700 lbs.



MODEL A-27-J
Elliptical springs and inner coil springs (in the upright supports) assure correct resiliency. Platform, 27″ x 60″. Load capacity, 600 lbs.

PNEUMATIC CORE TRUCKS



Since 1925 foundries have been using CMD PNEUMATIC CORE TRUCKS to speed up the handling of cores and reduce chafing and breakage. In many places costs have been reduced from 50 to 75 per cent.

Write Today

for bulletin describing and illustrating CMD Pneumatic Core Trucks, Core Barrows, Resilient Core Racks, and other foundry specialties.

MODEL A-27
For the heaviest loads, this giant carrier is widely used. Heavy-duty elliptical springs and inner coil springs (in the upright supports) quickly absorb shocks that could chafe or break cores. Three sizes: 27″ x 60″, 800 lbs. capacity; 27″ x 72″—1,000 lbs. capacity; and 27″ x 84″—1,200 lbs. capacity.

CMD CORE BARROWS
Have pneumatic tires and inner coil springs in the uprights over the wheels. MODEL C-2 shown here. MODEL C-1 (with one wheel) also available.

CHICAGO MANUFACTURING AND DISTRIBUTING CO.

1928 WEST 46th STREET CHICAGO 9, ILLINOIS

2 Outstanding Norton RESINOID WHEELS

Two wheels that give you both a fast, smooth cutting action . . . and long life !

B-5

OVER two years ago, Norton research developed and made available **B-5 Resinoid Bond.** Since that time, thousands of Norton wheels with this special resinoid bond have been tried and tested in foundries everywhere. Their steadily increasing popularity proves that B-5 helps wheels in the soft and medium hard range to cut fast and smooth without sacrifice of wheel life, and to stay sharp without frequent dressing.

B-7

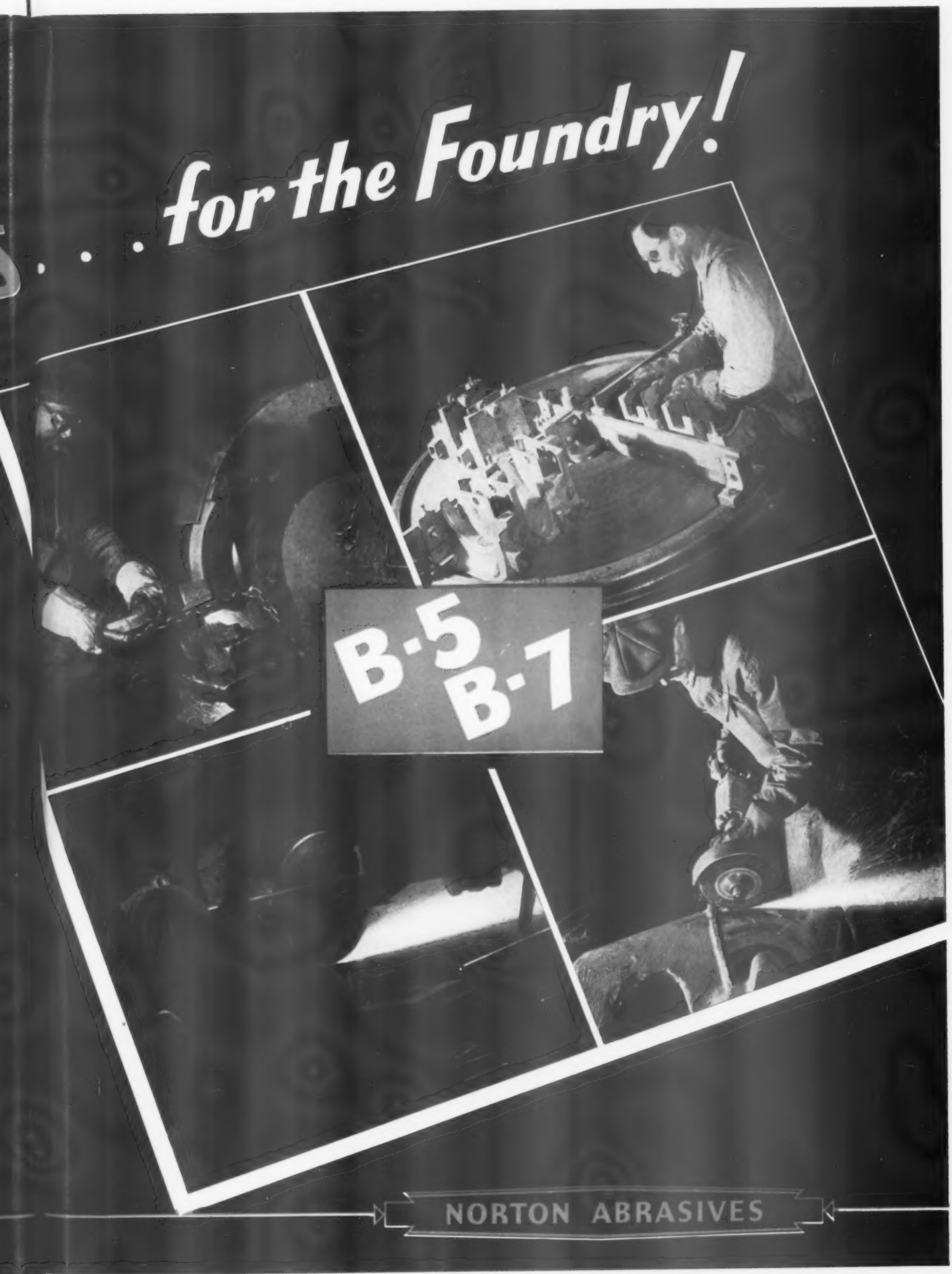
NORTON **B-7 Resinoid Bond**—a stronger and more heat-resistant bond—brings to wheels in the harder grades the same combination of fast cutting action and long life typical of B-5 in the softer grades. These two outstanding bonds, B-5 and B-7, (and other resinoid bonds of an even more durable and heat-resistant nature for special jobs) are available with all Norton abrasives for foundry wheels.

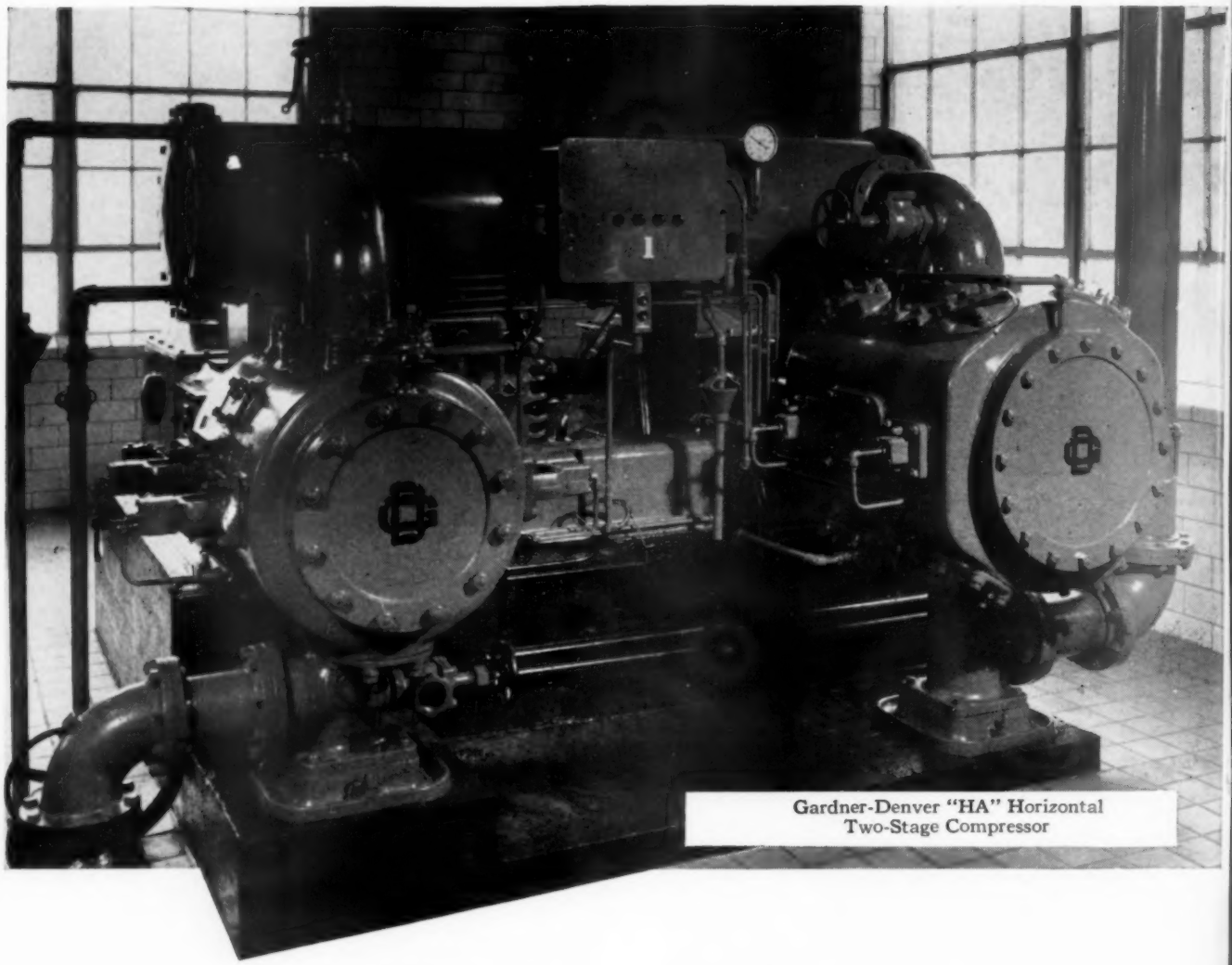
Call in your Norton abrasive engineer, or the abrasive specialist of your Norton distributor, for specific recommendations.

NORTON COMPANY • WORCESTER 6, MASS.

Distributors In All Principal Cities

W-1212


. . . for the Foundry!
B-5
B-7
NORTON ABRASIVES



Gardner-Denver "HA" Horizontal
Two-Stage Compressor

For MORE Years of Service

Why do Gardner-Denver "HA" Horizontal Compressors continue to give you full-load, heavy-duty service year after year? Why do volumetric efficiencies remain high, horsepower requirements stay low? One reason is that their cylinders are *correctly* designed. Valve and port areas are large and unrestricted—resulting in low velocities and minimum friction losses. Highly effective water jacketing further reduces heat of compression . . . insures thorough lubrication with less oil . . . increases compression efficiency. Here are other "HA" features you will like:

* *Air Cylinders oiled by force-feed lubricator with separate and adjustable feed to each cylinder.*

* *Heavy-duty side crank type main frame of massive design—heavily ribbed and reinforced to give maximum strength and rigidity.*

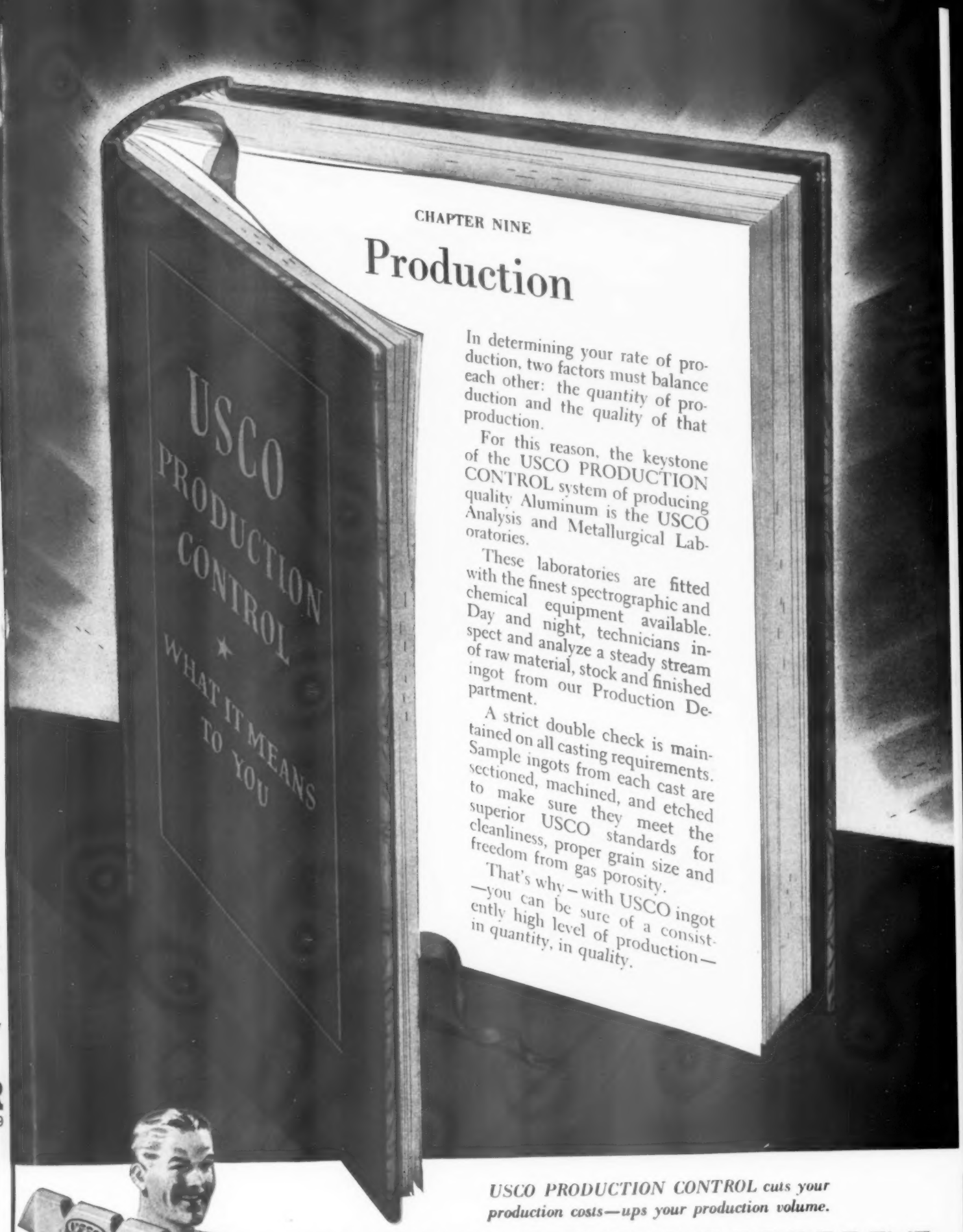
* *Alloy cast steel box type crossheads with removable high-lead-bronze shoes.*

* *Duo-Plate cushioned valves for high delivery capacity, high compression efficiency and lowest power consumption.*

* *Timken Roller Main Bearings eliminate shaft friction and wear—provide permanent rigidity with freedom from bearing vibration, pounding and side thrust.*

For complete information, write Gardner-Denver Company
Quincy, Illinois

GARDNER-DENVER
SINCE 1859



CHAPTER NINE

Production

In determining your rate of production, two factors must balance each other: the *quantity* of production and the *quality* of that production.

For this reason, the keystone of the USCO PRODUCTION CONTROL system of producing quality Aluminum is the USCO Analysis and Metallurgical Laboratories.

These laboratories are fitted with the finest spectrographic and chemical equipment available. Day and night, technicians inspect and analyze a steady stream of raw material, stock and finished ingot from our Production Department.

A strict double check is maintained on all casting requirements. Sample ingots from each cast are sectioned, machined, and etched to make sure they meet the superior USCO standards for cleanliness, proper grain size and freedom from gas porosity.

That's why—with USCO ingot—you can be sure of a consistently high level of production—in quantity, in quality.

USCO PRODUCTION CONTROL cuts your production costs—ups your production volume.

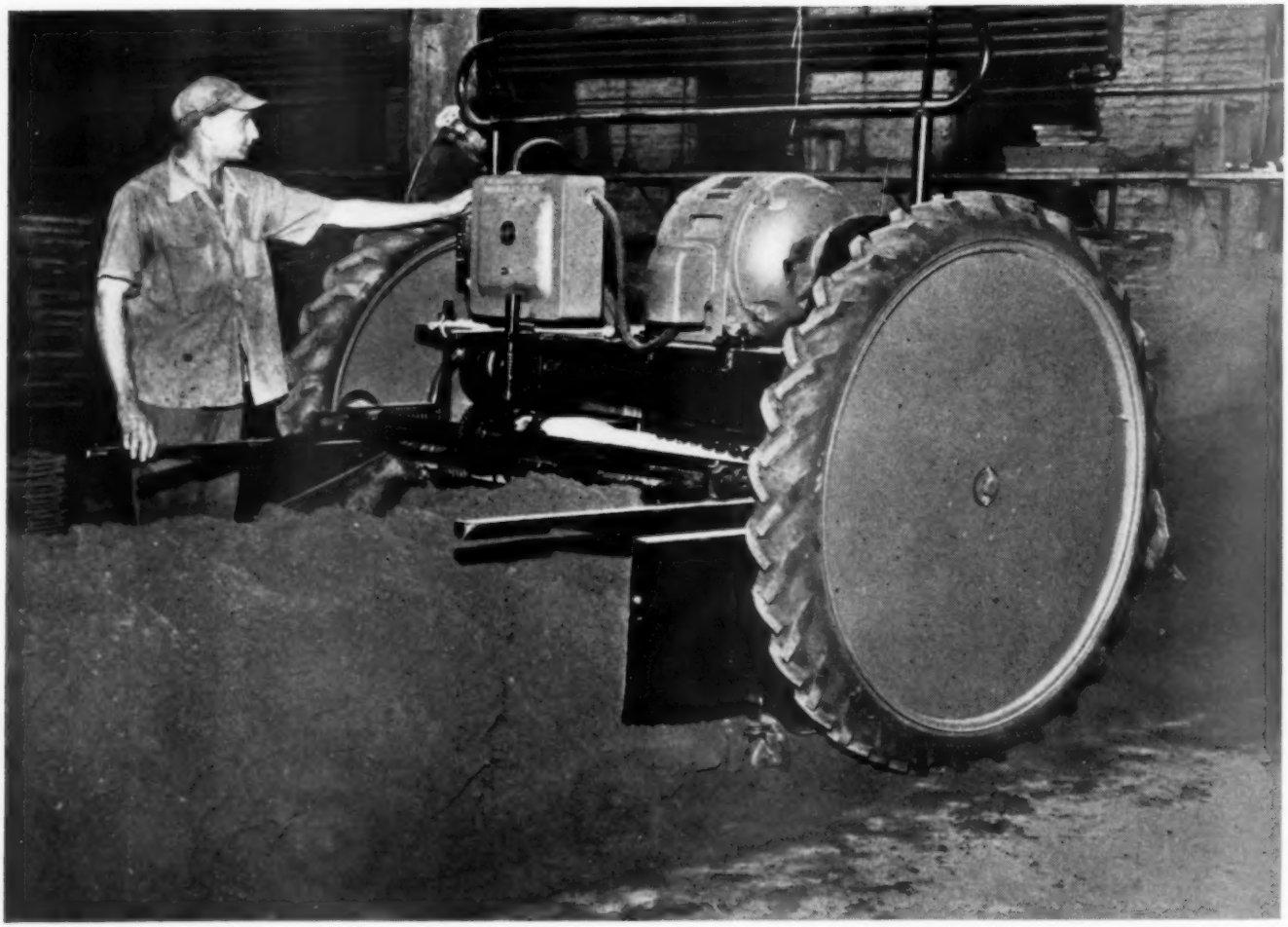
USCO ALUMINUM

Pioneer Producers of Quality Aluminum Ingot

U. S. REDUCTION CO. *East Chicago, Ind.*

ANNOUNCING....

"The Moulders' Friend" COMPLETELY MECHANIZED!



One Man Can Condition All the Sand Heaps in the Average Foundry

The New Moulders' Friend Travels at Two Speeds Conditioning Sand in Either Forward or Reverse

As The Moulders' Friend sand conditioner propels itself over the heap thousands of flat, tempered steel wires in the brush revolving at high speed pick up small particles of used sand, added bond and moisture and blend them thoroughly. The process is so thorough that either clay bond or new moulding sand is blended with the heaps successfully and a minimum of moisture is required.

This compact, simple machine fits your foundry. It is easy to buy and easy to use.

Write for Further Particulars

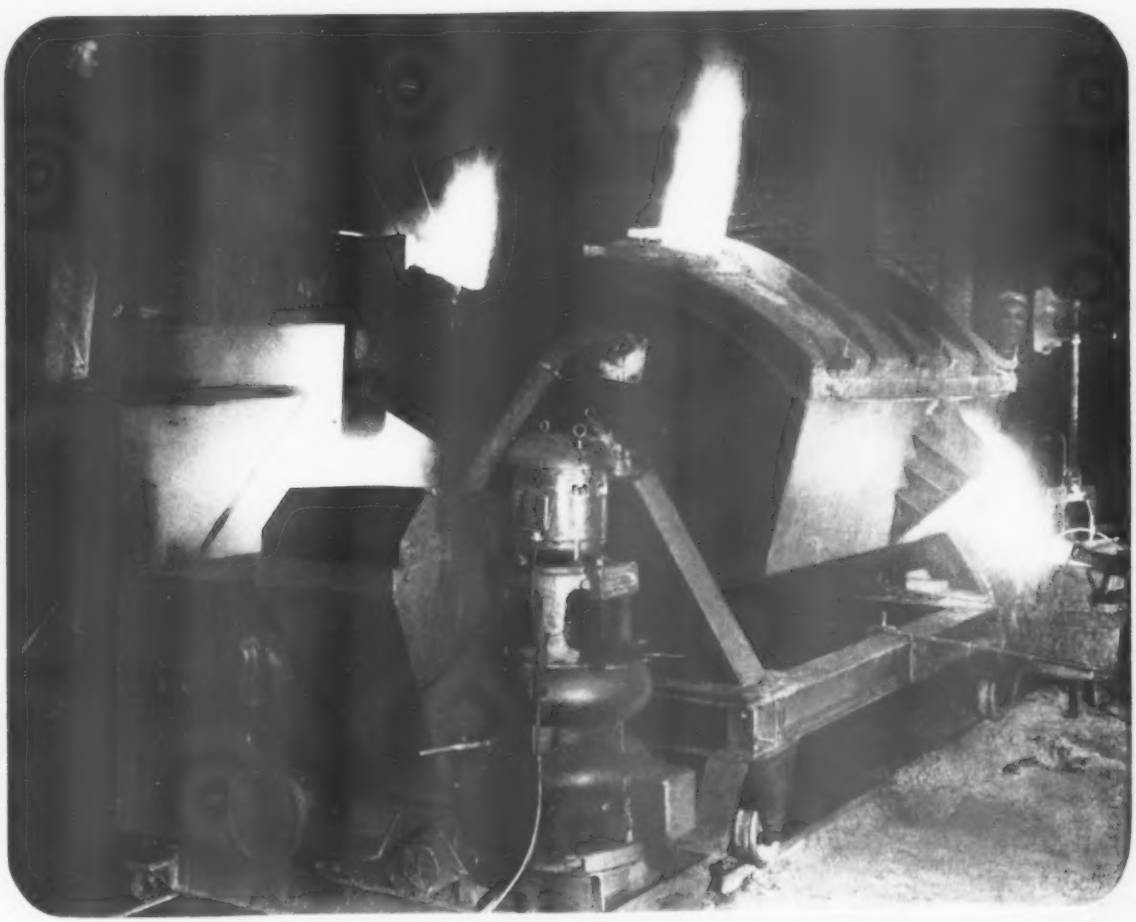
"The Moulders' Friend"

Sand conditioning Equipment
Dallas City, Ill.

KEEPS METAL HOT

Whiting's new 3-ton Heated Metal Mixer is direct-fired with pulverized coal or oil . . . keeps metal at pouring temperature. It also serves as a hot metal mixer, holding composition uniform. When desired it can be used for composition adjustments.

The Heated Metal Mixer operates as a tilting holding furnace with push-button control. Foundries that pour light, thin-sectioned castings are enthusiastic about results achieved through use of this equipment. Full information will be sent gladly on request.



WHITING
CORPORATION
15607 Lathrop Avenue, Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church Street, New York 7, N. Y.

LESS HORSEPOWER REQUIRED...

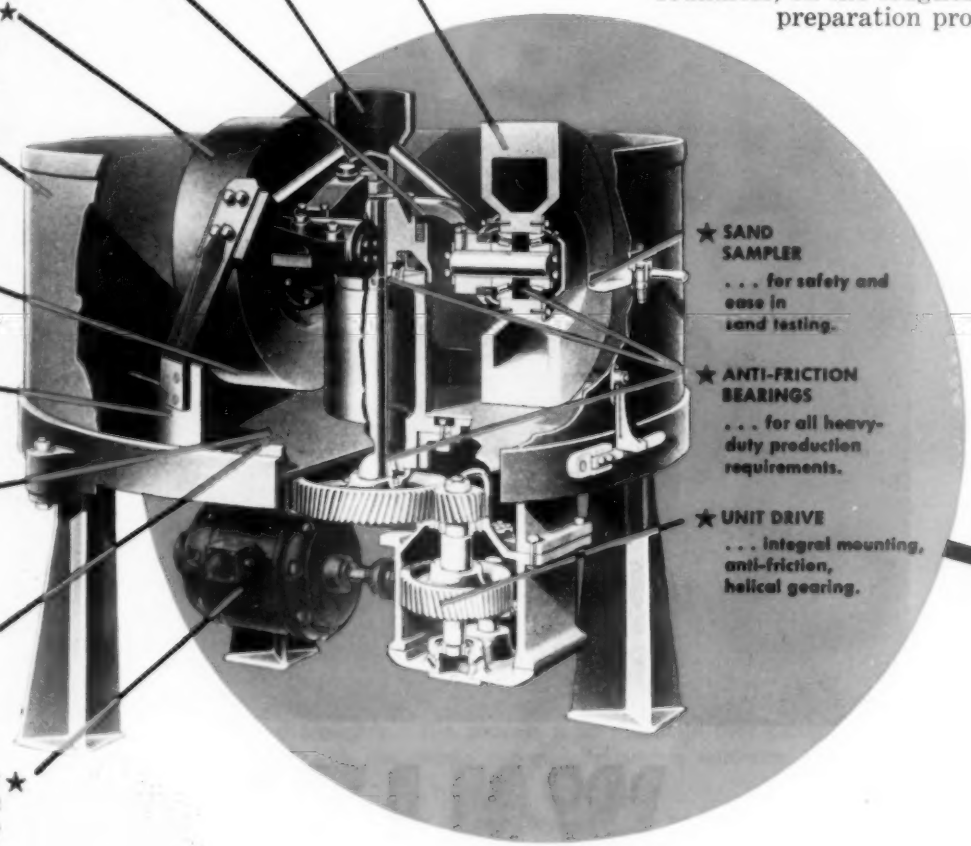
with SIMPSON MIXERS...

Obviously, the lower horsepower required to do an efficient, thorough sand preparing job, the lower the cost—for power and for maintenance. In Simpson Intensive Mixers, you are assured of the lowest horsepower per ton of properly prepared sand . . . made possible by these engineering features:

In the Simpson, sand lies upon a stationary pan, power being required only for working the sand—by rolling the mullers over the sand which the plows have windrowed into the muller path.

Second, the well-balanced design and precision workmanship of all moving parts reduces friction which reduces heat, thus requires less horsepower.

Listed below are some of the advanced engineering features responsible for the dependable, long-life operation of Simpson Mixers in all classes of foundries, on the toughest sand preparation problems:



VARIABLE MULLER WEIGHT ★
. . . changeable to suit your conditions.

WATER FUNNEL ★
. . . for correct water and oil additions.

ROCKER ARM PRINCIPLE ★
. . . full mulling, no grinding.

CHILLED IRON MULLER FACE ★
. . . five years minimum guarantee

HIGH CRIB ★
. . . holds maximum capacity with complete safety

SMEARING MULLER ACTION ★
. . . forward and sideways skid.

NECO PLOWS ★
. . . for longer wear, with wide range of adjustability.

BOTTOM DISCHARGE ★
. . . for safety and speed . . . available in multiple design.

SECTION WEARPLATE ★
. . . for safety, maintenance and greater mulling efficiency.

INTEGRALLY MOUNTED MOTOR ★
. . . perfect alignment . . . low maintenance.

★ **SAND SAMPLER**
. . . for safety and ease in sand testing.

★ **ANTI-FRICTION BEARINGS**
. . . for all heavy-duty production requirements.

★ **UNIT DRIVE**
. . . integral mounting, anti-friction, helical gearing.

NATIONAL ENGINEERING COMPANY

608 MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

. . . Less Cost per ton of sand

. . . made possible through the *Simpson Principle of Mulling*

ABOVE: Close-up of Simpson Mixer with crib removed. Note ripples in track of muller indicating sideways as well as forward smearing . . . a sure sign of true mulling action.

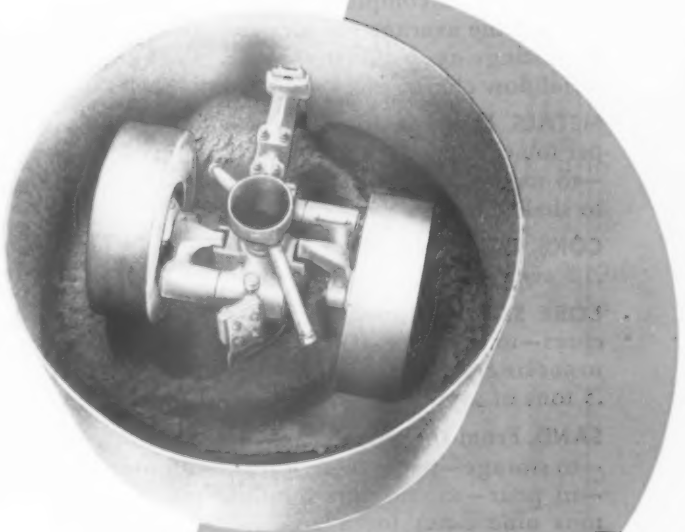
The Simpson principle of mulling, as effected in Simpson Mixers, is the most important factor in holding horsepower requirements, operating costs, and maintenance to a minimum. This principle, which provides the most efficient and economical method of preparing molding sand, offers the advantages of flowability, toughness, elasticity and uniformity of sand not obtained by any other method. Here, the term "mulling" implies the causing of the material to "cold flow" under pressure.

As illustrated in the accompanying views, the heavy muller wheels of a Simpson roll over the sand as it lies on the mixer bed, squeezing and kneading the sand. Plows then repile the sand in the muller path. Because the mullers are set slightly off the true radius, the smearing action is intensified . . . and only the Simpson employs this **true** mulling principle.

In the Simpson design, the mullers never approach closer to the bedplate than the diameter of at least ten sand grains . . . thus, there is no possibility of any crushing or grinding action.

Here, then, is **controlled** sand mixing at its best . . . let a National Engineer show you how to cut costs and improve product quality with Simpson Mixers.

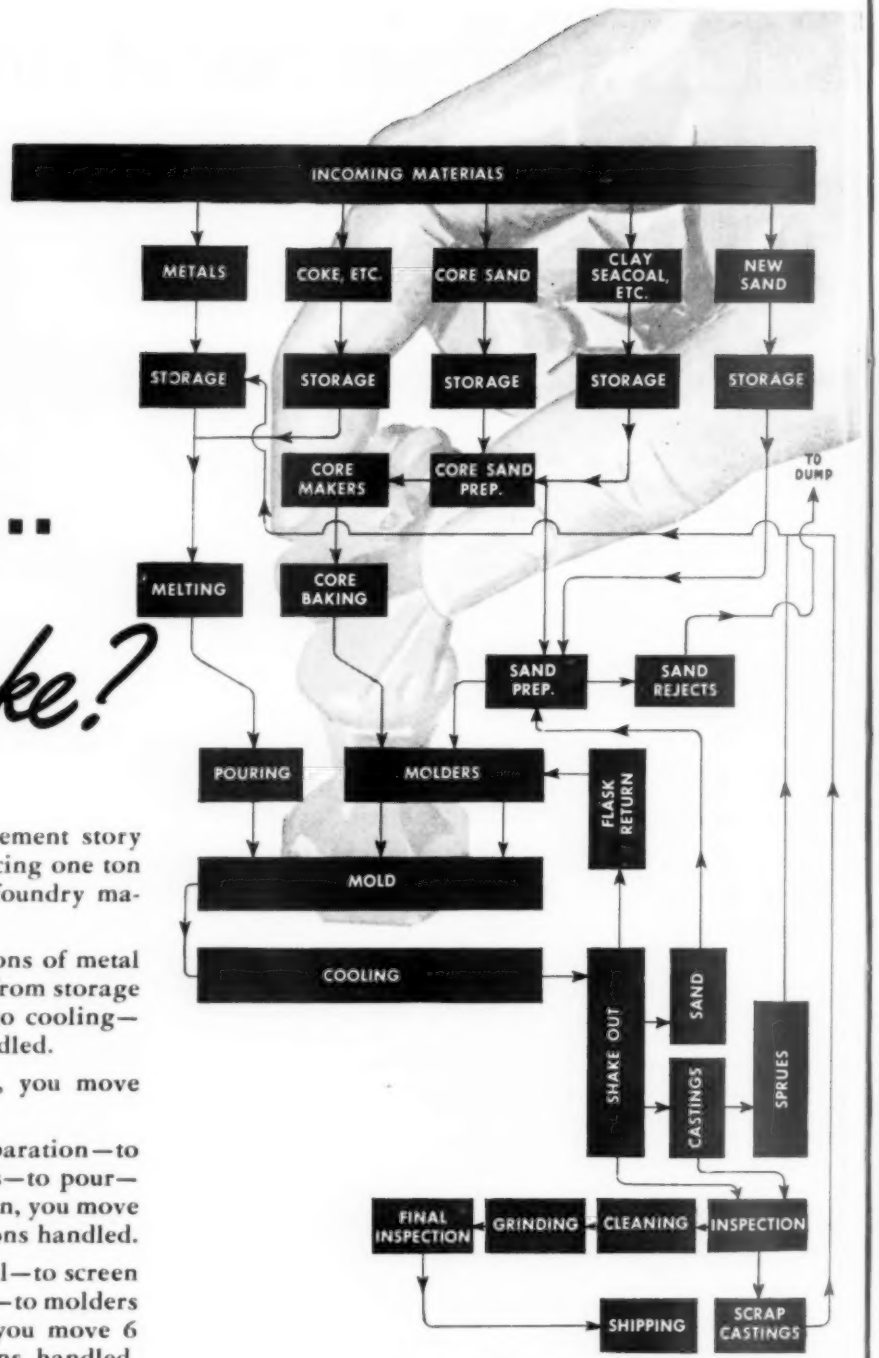
Call or write for complete details.



ABOVE: View of a standard 6-ft. diam. pan Simpson Mixer, at end of quarter turn. Muller track is very plain, with telltale smear marks showing, and plow turning over sand preparatory to feeding next muller.

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd., Sydney, Australia.

HOW MANY MOVES.... *do you make?*



HERE'S the complete material movement story for the average foundry in producing one ton of castings as demonstrated on this foundry material flow chart.

METALS. Figuring an average of 1.3 tons of metal per ton of castings, you move 1.3 tons from storage —to melting—to pouring—to mold—to cooling—to shakeout for a total of 6.5 tons handled.

COKE, ETC. From storage to melting, you move .12 average tons.

CORE SAND. From storage—to preparation—to cores—to racks—to ovens—to molders—to pour—to cooling—to shakeout—to preparation, you move .5 tons of sand nine times. Total 4.5 tons handled.

SAND. From shakeout—to iron removal—to screen —to storage—to mullers for tempering—to molders —to pour—to cooling—to shakeout, you move 6 tons nine times for a total of 54 tons handled.

SAND REJECTS. From preparation tower to dump, you move 3 tons.

FLASKS. From molding station—to pour—to cooling—to shakeout—to molding station, you move 1 ton four times. Total 4 tons handled (not including boards and weights).

CASTINGS. From shakeout—to inspection—to cleaning—to grinding—to inspection—to shipping—to carrier, you move 1 ton six times (minimum). Total 6 tons handled (not counting heat treatment).

SPRUES AND SCRAP. From shakeout—to inspection—to remelt, you move .3 tons twice. Total .6 tons.

TONS. An average minimum of 78.72 tons of materials handled to produce one ton of castings in the average foundry.

A Rex Foundry Engineer will be glad to show you how you can reduce the cost of foundry material movement with a Rex Foundry System. Chain Belt Company, 1671 West Bruce St., Milwaukee 4, Wis.

CHAIN BELT REX COMPANY

FOUNDRY HANDLING SYSTEMS

Cuts grinding time in half

Savings pay for tools in 5 months

THIS manufacturer of materials handling equipment was using universal electric grinders when the Rotor Application Engineer called to find ways of cutting grinding costs. The Rotor Application Engineer recommended replacement with Rotor Air Grinders and demonstrated them with these results:

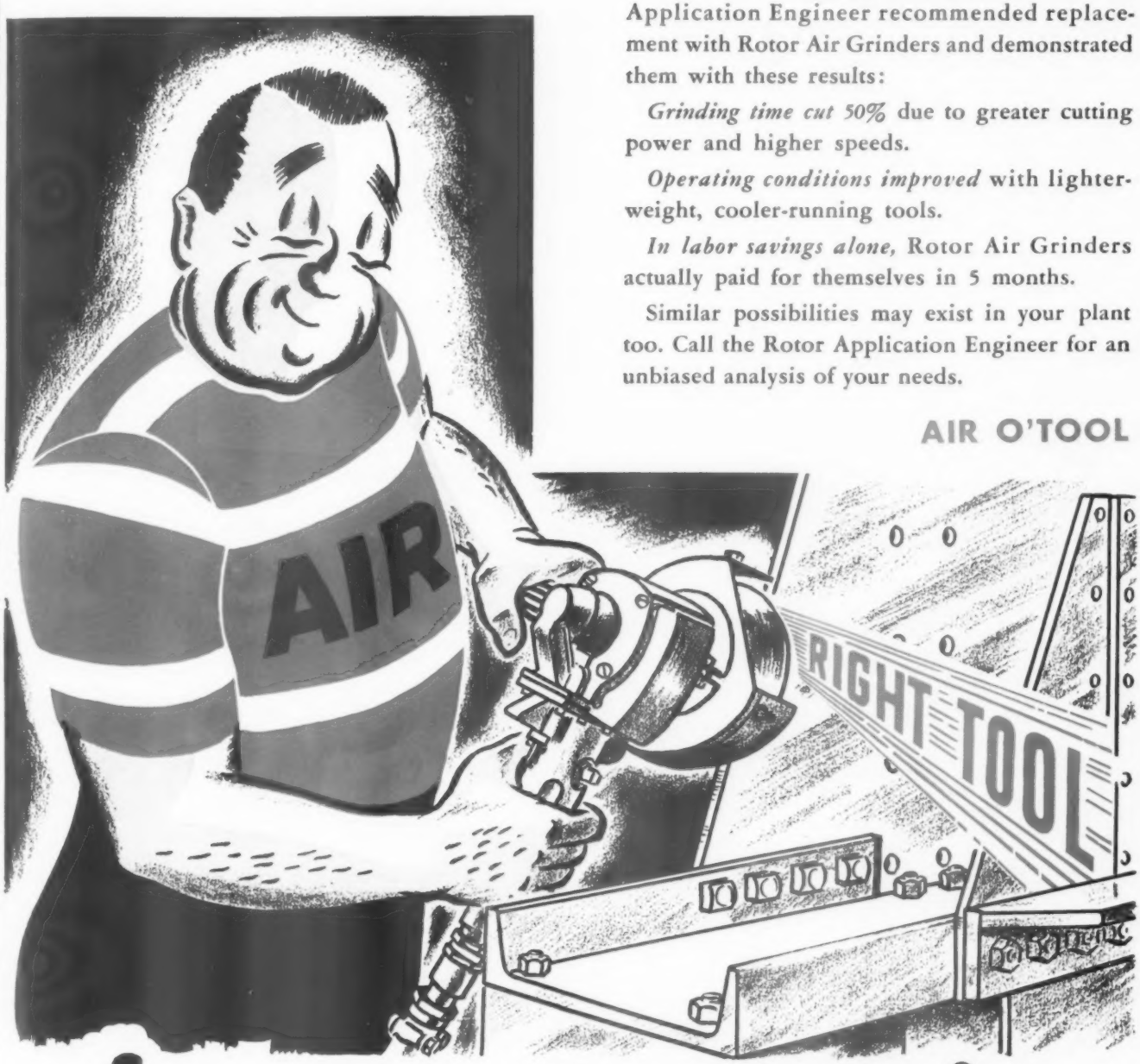
Grinding time cut 50% due to greater cutting power and higher speeds.

Operating conditions improved with lighter-weight, cooler-running tools.

In labor savings alone, Rotor Air Grinders actually paid for themselves in 5 months.

Similar possibilities may exist in your plant too. Call the Rotor Application Engineer for an unbiased analysis of your needs.

AIR O'TOOL



THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

That's Right! You Pay For These MILWAUKEE JOLT SQUEEZERS Out of . . . PROFITS!

No. 103 Stationary Jolt Squeezer

Safe, fast, easy to operate. Accessible from 3 sides. Maintains constant parallelism between jolt table and platen. 10" diameter squeezing piston exerts 6,200 lbs. pressure at 80 lbs. line pressure. Overall height 64".

No. 124 Portable Jolt Squeezer

Equipped with mold shelf, steel wheels and 12" diameter squeezing piston. Exerts 9,000 lbs. pressure at 80 lbs. line pressure. Conveniently located knee-operated vibrator valves. Easily and quickly portable. Overall height 68½".

IMMEDIATE DELIVERY

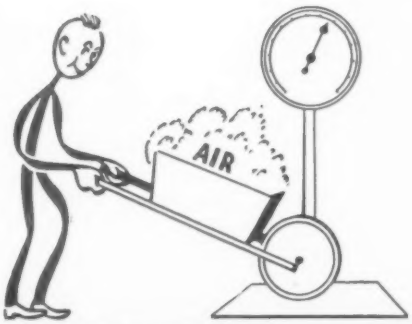
Milwaukee 10" and 12" Jolt Squeezers and 12" Jolt Squeeze Strippers are available today for immediate shipment. Write, wire, or phone your order — today.

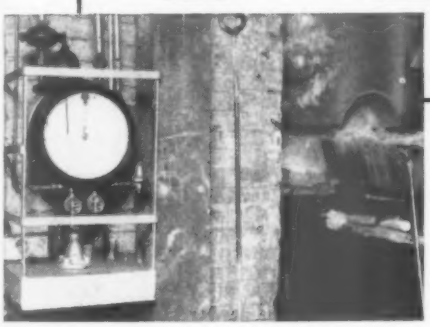
• Think of it! You can now buy Milwaukee Jolt Squeezers on our Easy Budget Plan. You get IMMEDIATE DELIVERY and pay for the machines out of PROFITS! This new Milwaukee budget plan enables you to replace old, obsolete machines and expand your foundry's productive capacity without the necessity of digging into cash reserves. You just can't lose. Modern Milwaukee Molders in your foundry will result in faster production, greater plant efficiency, bigger profits . . . profits that enable you to liquidate the cost of the new equipment while it works for you. Write today. We'll gladly explain budget plan in detail.

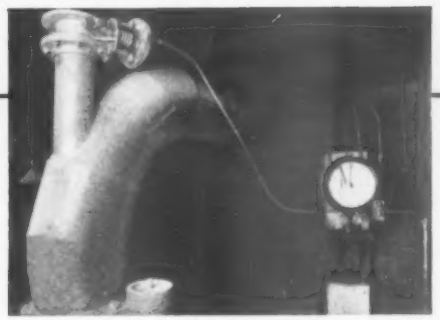
MILWAUKEE *Foundry Equipment Co.*

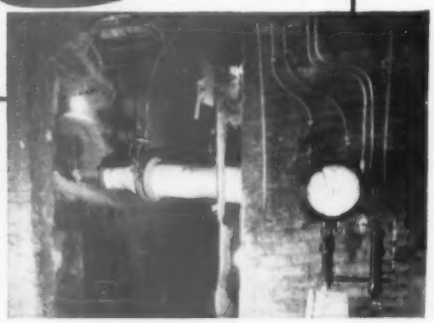
3238 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.A.

Uniform Heats depend on AIR WEIGHT CONTROL









1 **Heating Equipment Foundryman** *states: "This control gives uniform hot iron with absolute control of all mixtures. It has also decreased our melting time from 45 to 60 minutes per heat."*

2 **Grey Iron Foundryman** *reports: "Its automatic control of blast gives us uniformly hot iron all day long, regardless of air temperature."*

3 **Piston Ring Foundryman** *says: "Air-Weight Control has enabled us to cut our scrap from 16% to 8%, saving 500 lbs. of iron pigging before starting to cast."*

BY WEIGHING AIR as well as iron and coke, you can smooth out atmospheric variations that cause waste and lost production. That's because weighing air gives you an unvarying supply of oxygen, unaffected by changes in air temperature and pressure.

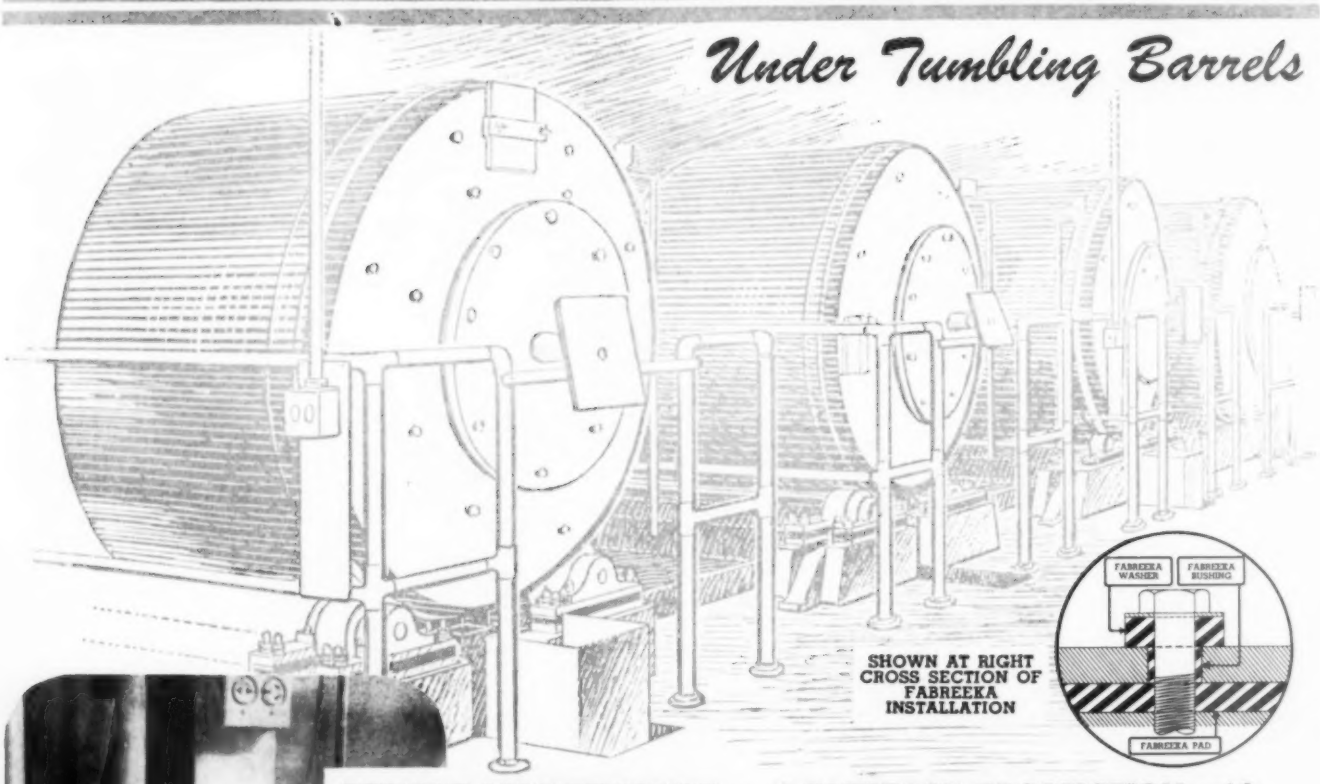
By weighing air with Foxboro's Air-Weight Controllers, hundreds of foundrymen have been able to beat rising costs of production with higher outputs, improved quality and less waste. In addition to uniformly hotter heats, they've eliminated pigging, reduced rejects, improved coke-iron ratio . . . all without any concern about the weather.

Unless you've watched cupolas operate with Foxboro Air-Weight Controllers on the blast, you can't fully realize how such a simple, inexpensive accessory can achieve so much. Why not investigate an installation near you. Foxboro will be glad to send you the location. In the meantime, get Bulletin B-268-2 describing this easily-installed production booster. Write **The Foxboro Company, 32 Neponset Ave., Foxboro, Mass., U. S. A.** Branches in principal cities.

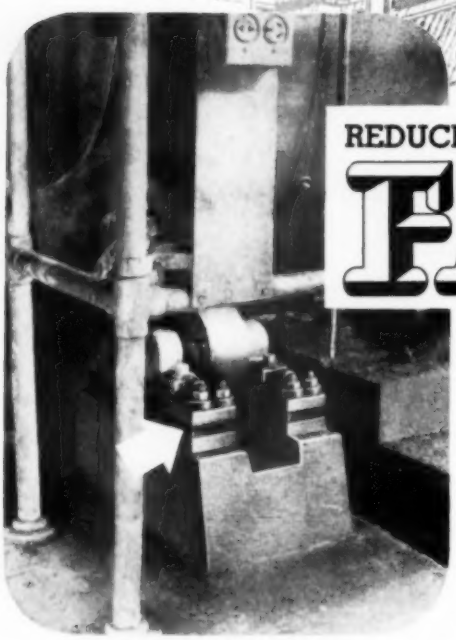
FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

for IMPACT SHOCK and VIBRATION

Under Tumbling Barrels



SHOWN AT RIGHT CROSS SECTION OF FABREEKA INSTALLATION



REDUCE MAINTENANCE and INCREASE PRODUCTION with

FABREEKA

FABREEKA Pads, bushings, and washers are installed under Jolt Moulders, Shakeout Machines, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production.

In addition to these important advantages, Fabreeka has long life, which makes its final cost a low cost.

Write for latest literature

It Pays to Specify Fabreeka

FABREEKA PRODUCTS COMPANY INCORPORATED
222B SUMMER STREET BOSTON 10, MASSACHUSETTS

HOUGH PAYLOADER

SAY "HUFF"

PATENT 2,412,323

Saves 60 Man Hours per day

Saves more than its first cost and operating charges in 6 months

A Model HA Payloader, in the foundry of George D. Roper Company, leading stove manufacturer, operates only four hours a day doing work that formerly required 60 man hours of labor, and releases 5 men for other essential work.

Hundreds of other foundries have also found there's profit in Payloaders, by savings in labor, time and costs and in increased production. Speedily twisting, turning and traveling, Payloaders go in and out of box cars and bins, up and down ramps, through narrow doorways and aisles . . . unload, load, transport and dump sand, slag, scrap, castings, coke and other bulk materials. They do quickly and easily many material handling tasks that are now slow, laborious and costly.

It will pay you to investigate the advantages of Payloaders for your own foundry. Get the facts on these modern material handling miracle workers.

Job Data:

Model HA Payloader at George D. Roper Company

- Windrows 288 tons of sand for cutting each night in 1½ to 2 hours.
- Delivers 30 tons of new sand from bins 250 feet distant in 1½ hours — formerly a 15 man-hour job.
- Moves castings from foundry to mill room — a 300 foot round trip.
- Does general clean-up work.
- Hauls discarded sand to the dump.

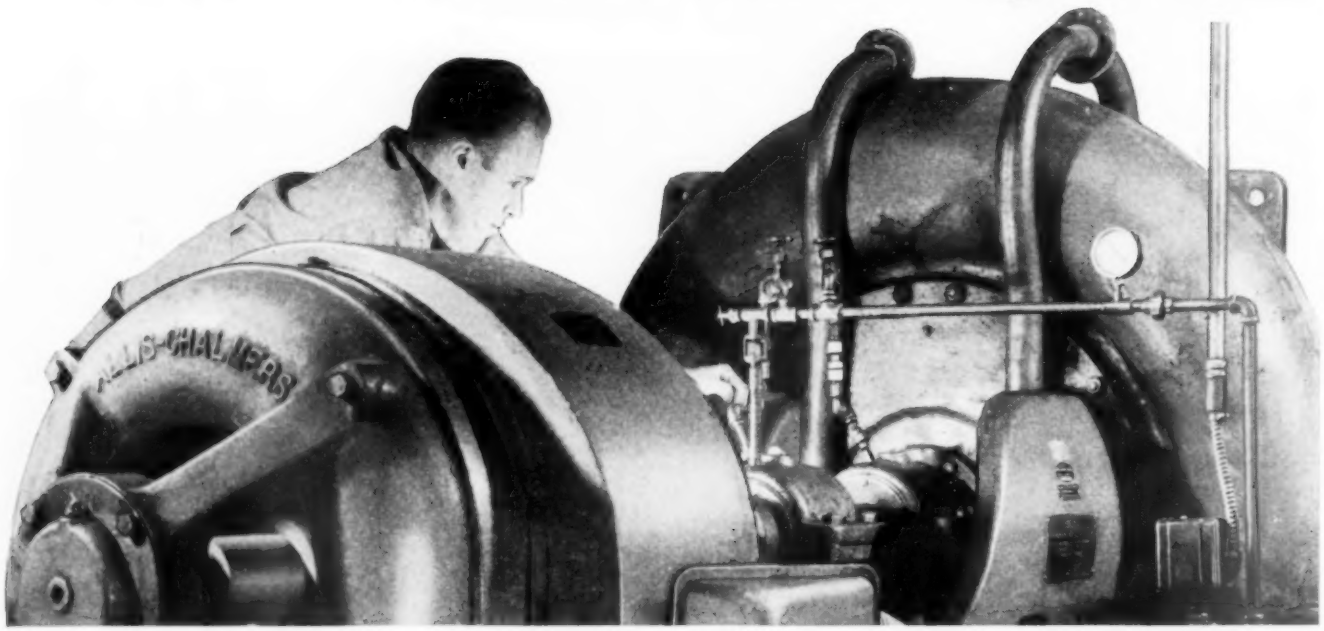
SEND TODAY for literature on the 10½ cu. ft. Model HA Payloader, the ¾ yd. Model HF, the 1¼ yd. Model HL, also the 2 yd. Payloader Buggy.

THE FRANK G. HOUGH CO.

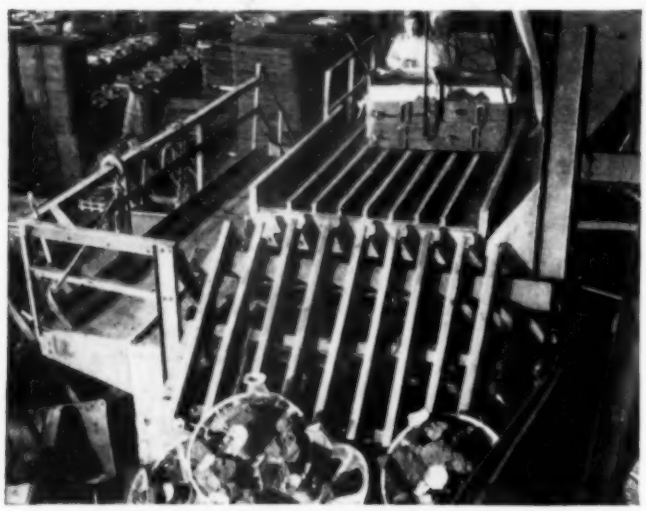
703 SUNNYSIDE AVENUE • LIBERTYVILLE, ILLINOIS

TRACTOR SHOVELS SINCE 1920

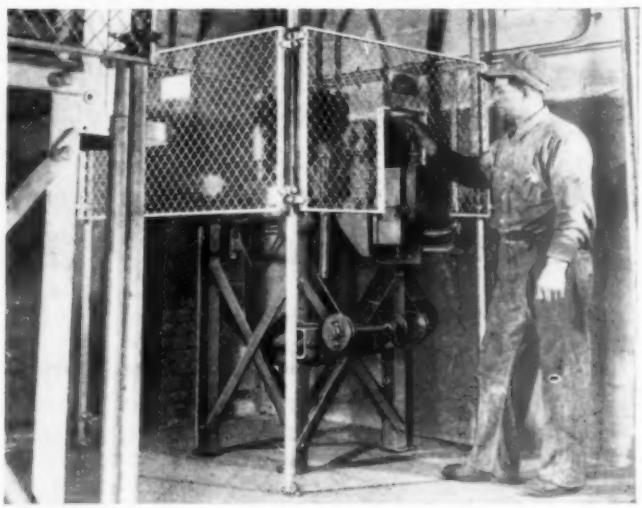
"Mechanization Speeds



1 TEAMWORK OF A-C FOUNDRY EQUIPMENT is demonstrated here at Grede's Spring City foundry. A 150 hp Allis-Chalmers squirrel cage motor is driving an A-C cupola blower with a normal air capacity of 12,800 cfm. This fan-cooled motor with a steel yoke is built for tough operation. With over 50 years experience in blower production, Allis-Chalmers produces units with proved rigidity, long life and a minimum of vibration. A-C single stage blowers are available in pressure ranges from one to 6.50 lbs.



2 TOP OPERATING EFFICIENCY SINCE 1942 is record of this 6 ft. x 8 ft. shakeout, one of nine Allis-Chalmers units at work in the five Grede foundries. *Foundromatic* shakeouts are available in five sizes and capacities for various job requirements. Full 25 ton load is easily handled on a single 8 ft. x 10 ft. unit. All sizes are designed and built for continuous, heavy-duty operation. Foundry tests have proven that a 12 ton casting can be shaken out on a *Foundromatic* shakeout in less than five minutes.



3 ALLIS-CHALMERS automatic power circuit breakers guard America's industrial circuits twenty-four hours a day. This indoor oil circuit breaker (15KV) in the Milwaukee steel foundry of Grede Foundries is oil-tight with totally enclosed pole unit mechanisms. Fifty years of A-C circuit breaker manufacturing experience back these units which meet all the requirements for industrial protective service. Grede foundry experience proves that A-C circuit breakers require little inspection or renewal of oil or contacts.

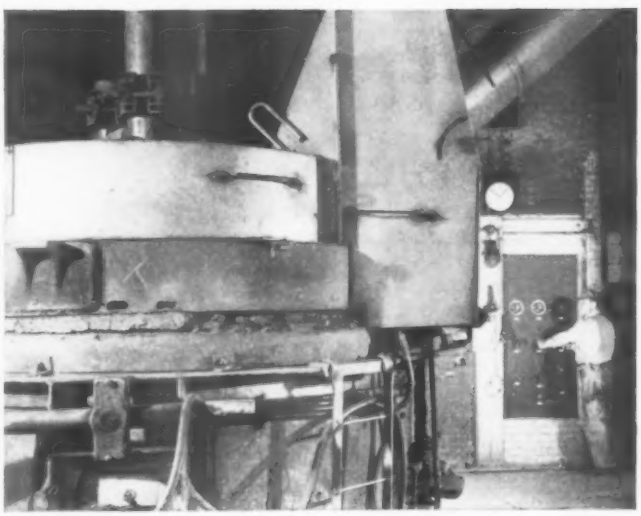
A 2568

Production, Cuts Costs"

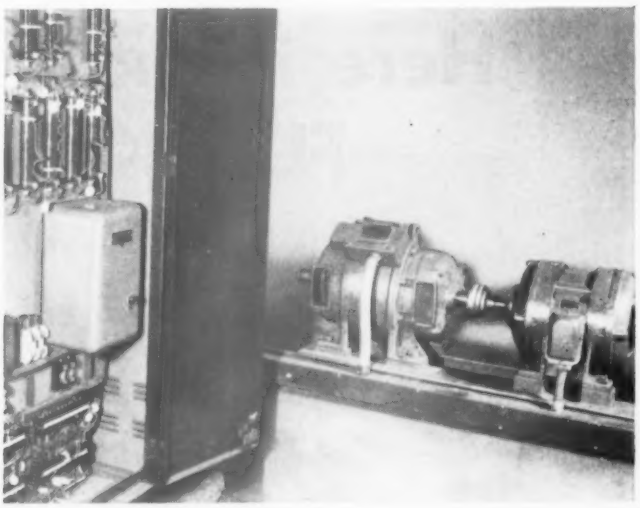
—SAYS BILL GREDE
President

Grede Foundries, Inc., Milwaukee

CONTINUOUS MECHANIZATION in the five Grede Foundries has increased productive capacity to over 30,000 tons a year. Grede products include gray iron and electric steel castings in sizes from ¼ pound to over 10,000 pounds, with a complete range of alloys. Use of good tools, scientific methods and close control in this growing organization have made it a "good place to work." Allis-Chalmers equipment has played an important role in this Grede foundry success story.



4 "MELTED UP TO 65 TONS A DAY in this three ton arc furnace equipped with *Regulex* controls," says Burleigh Jacobs, works manager of the Grede steel foundries. This record performance in the oldest steel foundry west of Pittsburgh can be attributed to accurate electrode control during all the changing conditions of the furnace charge. Illustration shows the switchboard for the *Regulex* generator and the Grede arc furnace. Note the ease with which operator can control the sensitive variable-voltage control.



5 MELT-DOWN TIME IS SHORTENED — furnace output is boosted in the main Grede foundry with this *Regulex* control. Arc furnaces of all sizes, from one half ton to 100 ton capacity, are now equipped with the proved *Regulex* rotating control, which did away with contactor control. Simple, sturdy generators are used in the *Regulex* furnace control set.

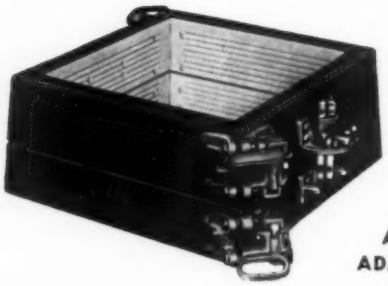
Grede Foundries success with Allis-Chalmers equipment can be duplicated in YOUR foundry. Consult your nearby A-C district office, or write direct.

ALLIS-CHALMERS, 1032A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

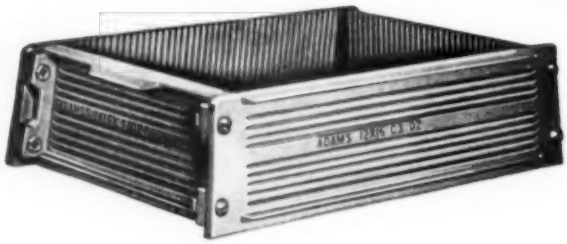
Pioneers in Power and Electrical Equipment — Biggest of All in Range of Industrial Products

Patent No.
2066547
ADAMS ALUMINUM SLIP FLASKS



Patent
Applied For
ADAMS CHERRY
EASY-OFF
FLASK

Patent No.
2055548
ADAMS STEEL
JACKETS



Patent No.
2124639
ADAMS JACKETS
Cast Iron and
Aluminum

ADAMS
ALUMINUM UPSET

Here is the Complete line of FLASK EQUIPMENT

Specify ADAMS Foundry Equipment

For half a century Adams Flask Equipment has been recognized as a leader. Custom built by experts for strength and long life and utilizing the finest materials available, it has become an important factor in better molding practice. Whatever your requirements get in touch with Adams. Write for descriptive literature, today. THE ADAMS COMPANY, 800 Foster St., Dubuque, Iowa.

Cherry Snap Flasks
Cherry Slip Flasks
Aluminum Slip Flasks
Easy-Off Flasks
Cherry Presser Boards
Wood Bottom Boards
Steel Bottom Plates
Steel Jackets
Aluminum Jackets
Cast Iron Jackets
Steel Bands
Steel Upsets
Cherry Upsets
Aluminum Upsets

The ADAMS Company

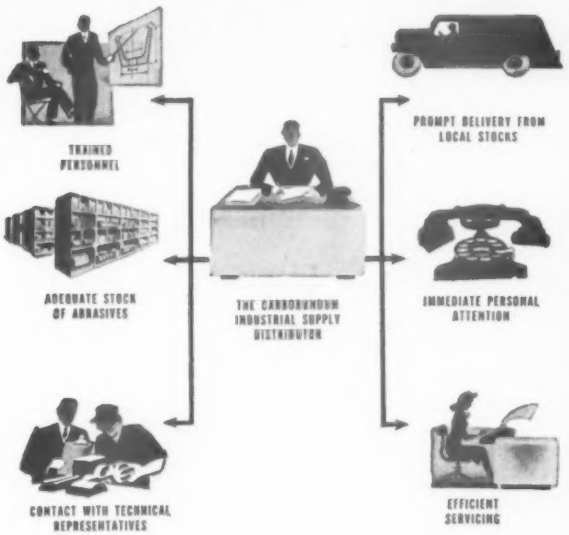
ESTABLISHED 1853

DUBUQUE, IOWA, U.S.A.

MOLDING MACHINES and FLASK EQUIPMENT

A BUYING GUIDE FOR ABRASIVES

ABRASIVE PROBLEM:
Where is there a convenient Source of Supply?



ANSWER BY

CARBORUNDUM
TRADE MARK

As an efficient and dependable source of supply, the services and facilities of your CARBORUNDUM distributor offer time and money saving advantages.

From large and varied stocks of abrasives located conveniently nearby, the products you need are available without delay. Plant inventories can be safely and economically reduced.

Frequent personal service by a trained and experienced local staff provides reliable facts and figures on abrasive applications and operations.

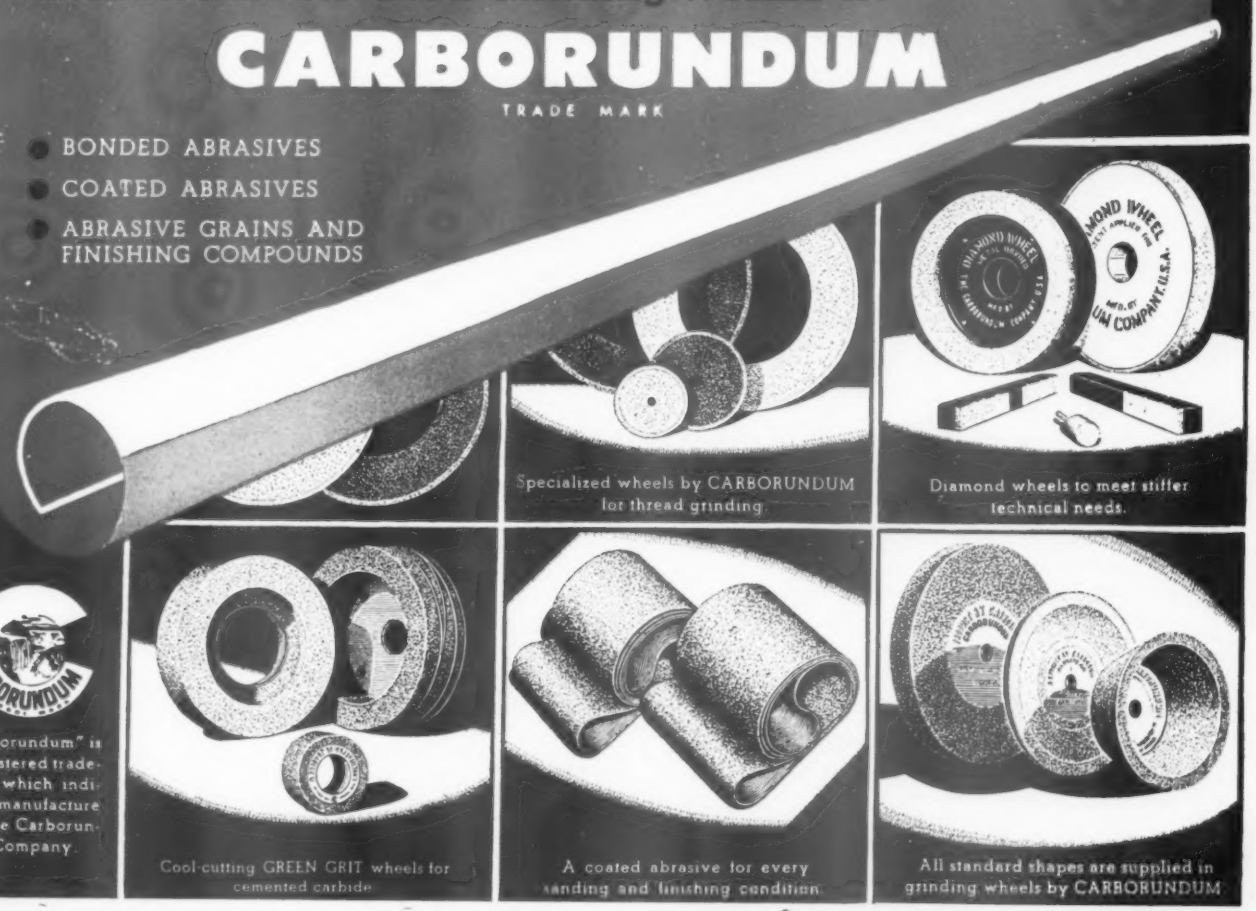
On difficult or unusual jobs, direct assistance from CARBORUNDUM representatives is available.

Simplified buying and other important savings realized from intelligent and efficient handling are creating an increasing preference for abrasives by CARBORUNDUM. The Carborundum Company, Niagara Falls, New York.

A Good Rule for Good Grinding...CALL IN

CARBORUNDUM
TRADE MARK

- BONDED ABRASIVES
- COATED ABRASIVES
- ABRASIVE GRAINS AND FINISHING COMPOUNDS



Specialized wheels by CARBORUNDUM for thread grinding.

Diamond wheels to meet stiffer technical needs.

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company.

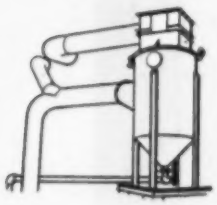
Cool-cutting GREEN GRIT wheels for cemented carbide

A coated abrasive for every sanding and finishing condition

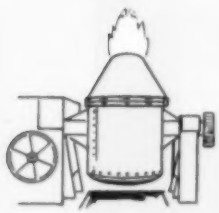
All standard shapes are supplied in grinding wheels by CARBORUNDUM

Whiting Designs and Builds

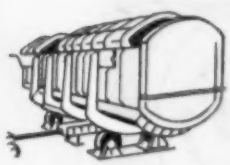
DUST SUPPRESSORS



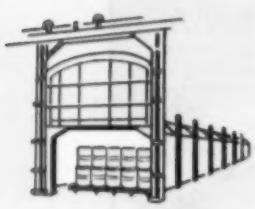
CONVERTERS



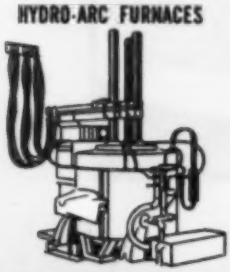
CRADLE FURNACES



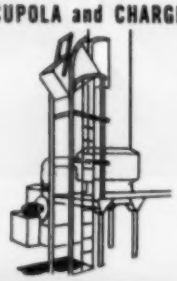
ANNEALING OVENS



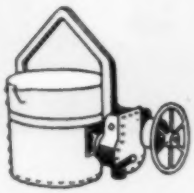
HYDRO-ARC FURNACES



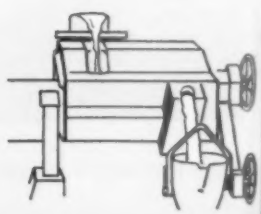
CUPOLA and CHARGER



LADLES



MIXING LADLES



PROFITABLE foundry operation demands efficient materials handling, charging, melting, and metal distribution.

In those operations Whiting engineers are pre-eminent . . . their practical knowledge and long experience enable them to devise methods and recommend equipment that reduces cost and gives closer metallurgical control.

Whiting engineers welcome the opportunity to work on your problems. Whiting Corporation, 15607 Lathrop Ave., Harvey, Illinois.

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CORPORATION
15607 Lathrop Avenue, Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York, N. Y.

MAKE-UP. This materials yard is served by two Whiting Cranes. Coke and stone hopper and iron loading platform are in the right foreground.

CHARGING. Whiting supplies every kind of charging equipment from simple skip hoists to all types of crane chargers.

Complete Systems

FOR MATERIALS HANDLING, CHARGING, MELTING, METAL DISTRIBUTION

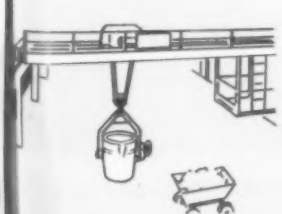
DISTRIBUTION. Whiting Pouring Systems include light cranes, monorails, ladle handlers, and ladles for conveying hot metal quickly and safely to the molds.

MELTING. This Duplexing System consists of a Whiting Cupola and a Whiting Air Furnace. We also make converters, electric furnaces, cradle furnaces, rotary furnaces, heated metal mixers, reservoir, and U-ladles.

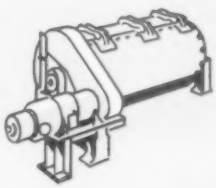
DUST SUPPRESSION. Whiting Hydro-Clones provide wet collection of foundry dusts, converting them to harmless, easily disposable sludge. Here a Hydro-Clone Unit is directly connected with two Whiting Tumbling Mills.

POURING. Whiting Ladles and Ladle Handlers are the engineering result of years of practical experience in foundry operation. They are designed for greatest pouring ease, safety, long life, and trouble-free operation.

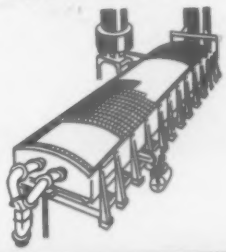
CRANES



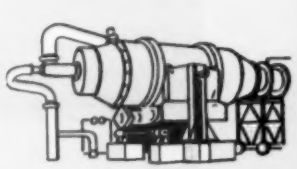
TUMBLERS



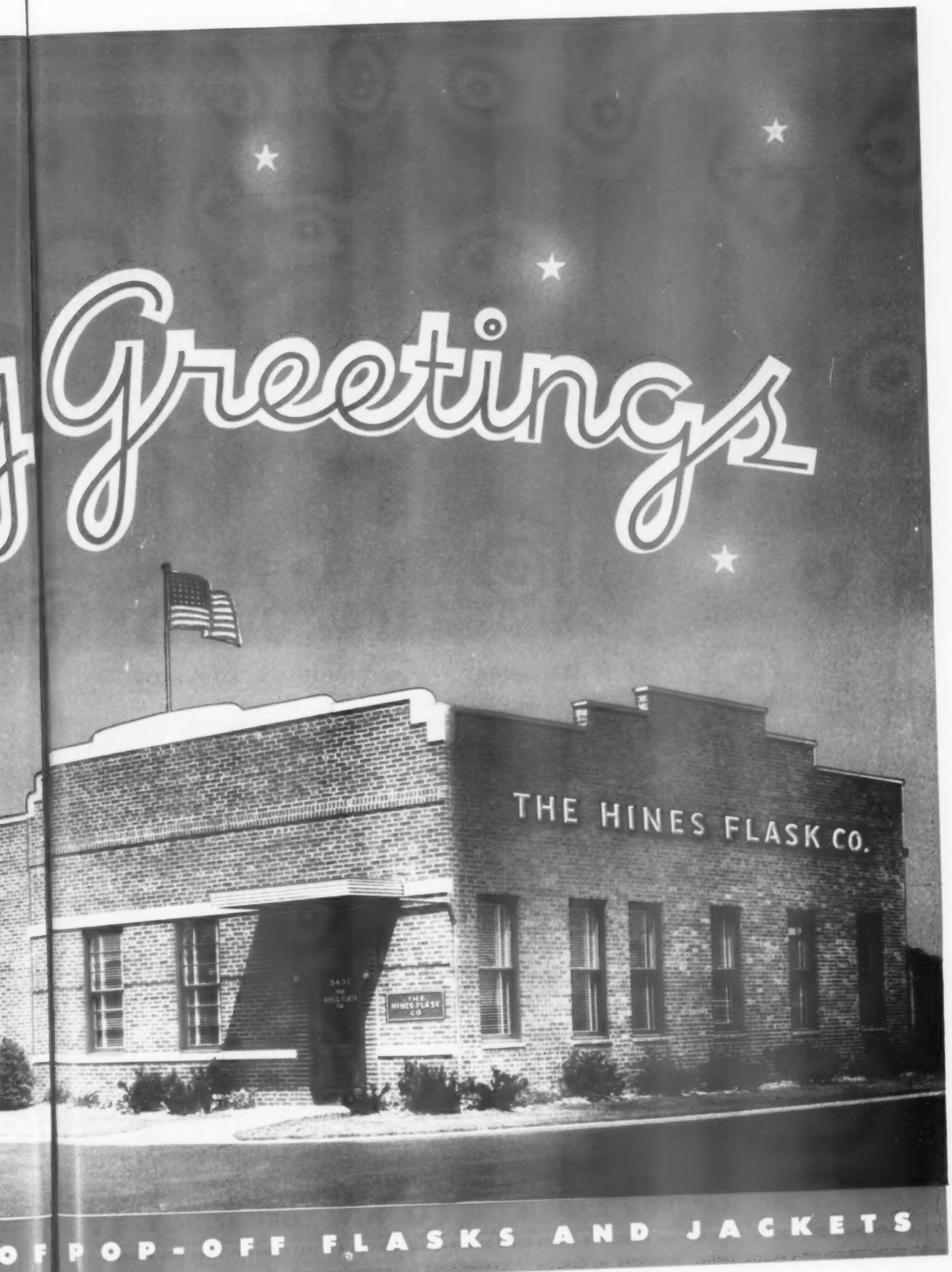
DUPLEXING SYSTEMS



ROTARY FURNACES



PATENTED
Holiday
THE EXCLUSIVE PRODUCERS OF


Greetings
THE HINES FLASK CO.
THE HINES FLASK CO.
OF POP-OFF FLASKS AND JACKETS

Left: **Heat Treat Oven for non-ferrous metals showing castings supported on door shelves.**
Right: **Battery of Core Ovens showing apparatus for individual heating and temperature control.**

Keynote!
Modernize
Your
Equipment
Sept.-Oct. 1—Canadian Conference of Ontario and Eastern Canada-Newfoundland AFS Chapters, Montreal.
Oct. 12-16—American Chemical Society, Chicago Section, Fifth National Chemical Exposition, Chicago Coliseum, Chicago.
Oct. 15-16—New England Foundrymen's Association, regional conference, Boston.
Feb. 10-11—Wisconsin Chapters of AFS, regional conference, Milwaukee. (Tentative)
Feb. 17-19—Birmingham Chapter of AFS, regional conference, Birmingham.
Feb. 28-Mar. 4—ASTM Committee Week, Edgewater Beach Hotel, Chicago.
Mar. 10-11—Ohio Regional Conference sponsored by Ohio AFS Chapter, Columbus, O. (Tentative)
May 2-5—American Foundrymen's Society, annual convention, St. Louis.
June 27-July 1—American Society for Testing Materials, annual meeting, Atlantic City, N. J.
Oct. 10-14—American Society for Testing Materials, Pacific Coast meeting, San Francisco.

ROSS CORE and HEAT TREAT OVENS

STATIONARY · CONTINUOUS · CONVEYOR

In view of competitive standards and increasing costs for labor, material and fuel, the slow, wasteful operating methods are definitely out. Overbaked or underbaked cores and improperly heat treated castings and forgings are major causes of waste and inefficiency. ROSS Ovens, expertly designed to perfectly maintain uniform temperatures throughout all sections of the oven can effect savings sufficient to rapidly offset the cost of installation. Ask us to show you what can be done.

Older type ovens, if in good shape, can be modernized with properly designed ROSS Heating Systems. Consult us. You might be surprised at the possibilities uncovered by our engineers.

ROSS SYSTEMS

J. O. ROSS ENGINEERING CORPORATION

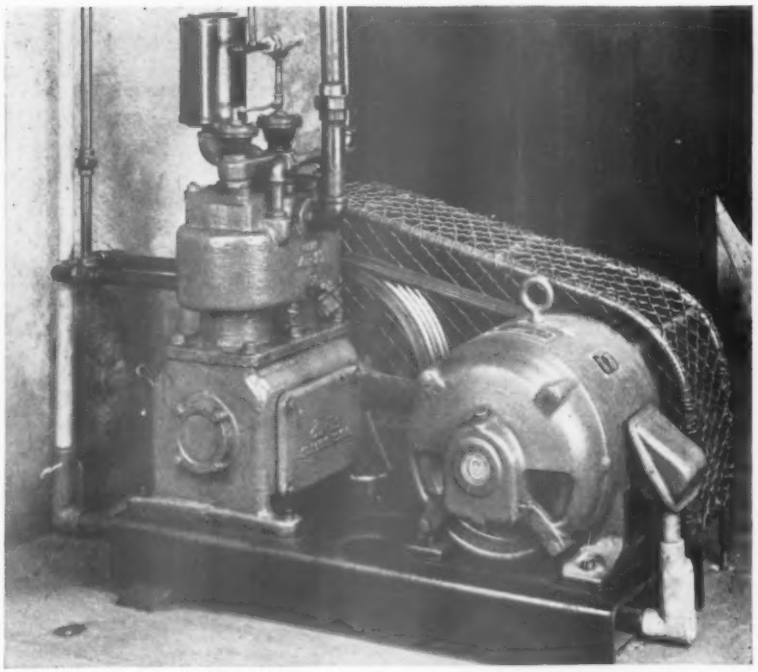
MANUFACTURERS OF AIR PROCESSING SYSTEMS

350 MADISON AVENUE NEW YORK 17, N. Y.

201 N. Wells Street, CHICAGO-6 • 79 Milk Street, BOSTON-9 • 9225 Grand River Avenue, DETROIT-4 • 1231 E. Seventh Street, LOS ANGELES-21

ROSS ENGINEERING OF CANADA, LIMITED, MONTREAL 19, CANADA • CARRIER-ROSS ENGINEERING COMPANY, LIMITED, LONDON, ENGLAND

Curtis Timken Bearing Air Compressor. Sizes from ¼ to 50 H. P., inclusive.



RELIABILITY
That Pays Off in Low-Cost Performance

CURTIS
TIMKEN BEARING AIR COMPRESSORS

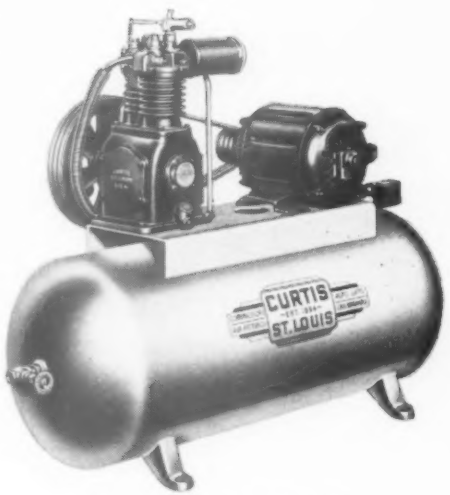
WHATEVER the application, in thousands of varied industrial installations, Curtis Timken Bearing Equipped Air Compressors have a long and proven record of extreme reliability, low maintenance expense and unusually long life.

Every Curtis Air Compressor has been carefully engineered, made of the highest quality materials and precision built throughout.

Their dependable, economical performance is the result of such design advantages as:

- Timken Roller Bearings
- Self-Oiling—Positive Lubrication
- Carbon-Free Disc Valves
- Automatic Pressure Unloader
- Fully Enclosed Design
- Precision Construction

Specify CURTIS when you want a reliable, low-cost supply of air for *any* use. Capacities from ¼ to 50 H.P. (up to 300 CFM).



Curtis Timken Bearing Air Compressor with tank. Sizes from ¼ to 10 H.P., inclusive.

Write today for full information on Curtis Air Compressors, Air Hoists and Air Cylinders—or mail the coupon below.

I-48-1

CURTIS

PNEUMATIC MACHINERY DIVISION

of Curtis Manufacturing Company

1922 Kienlen Avenue - - St. Louis 20, Missouri

94 Years of Precision Manufacturing

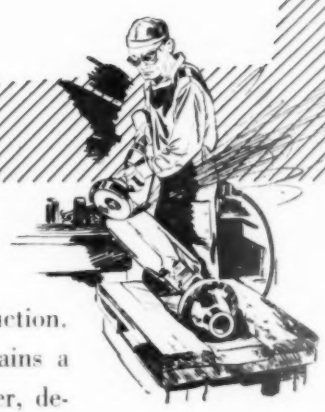
CURTIS PNEUMATIC MACHINERY DIVISION *of Curtis Manufacturing Company*
1922 Kienlen Avenue, St. Louis 20, Missouri

Please send me Form C-7 on Curtis Air Hoists, Air Cylinders and Curtis Air Compressors.

Name.....
Firm.....
Address.....
City..... Zone..... State.....

This Steel Clad Grinder

can take it!



One of the chief points kept in mind in the complete redesigning of CP's line of pneumatic grinders was the ruthless treatment a grinder commonly gets. Hence—the CP Steel Clad Grinder that can take a tough beating and stay in constant service.

A steel frame, with eutectic welded steel construction used for the first time in any grinder—plus an air motor of increased horsepower, unsurpassed in power by any other grinder on the market—with speed controlled by the CP governor—makes an unmatchable tool for sustained production.

With its reserve power it maintains a constant speed. Thus the 6″ grinder, designed for 6,000 r.p.m., runs at that speed regardless of how hard the operator bears down or however tough the work.

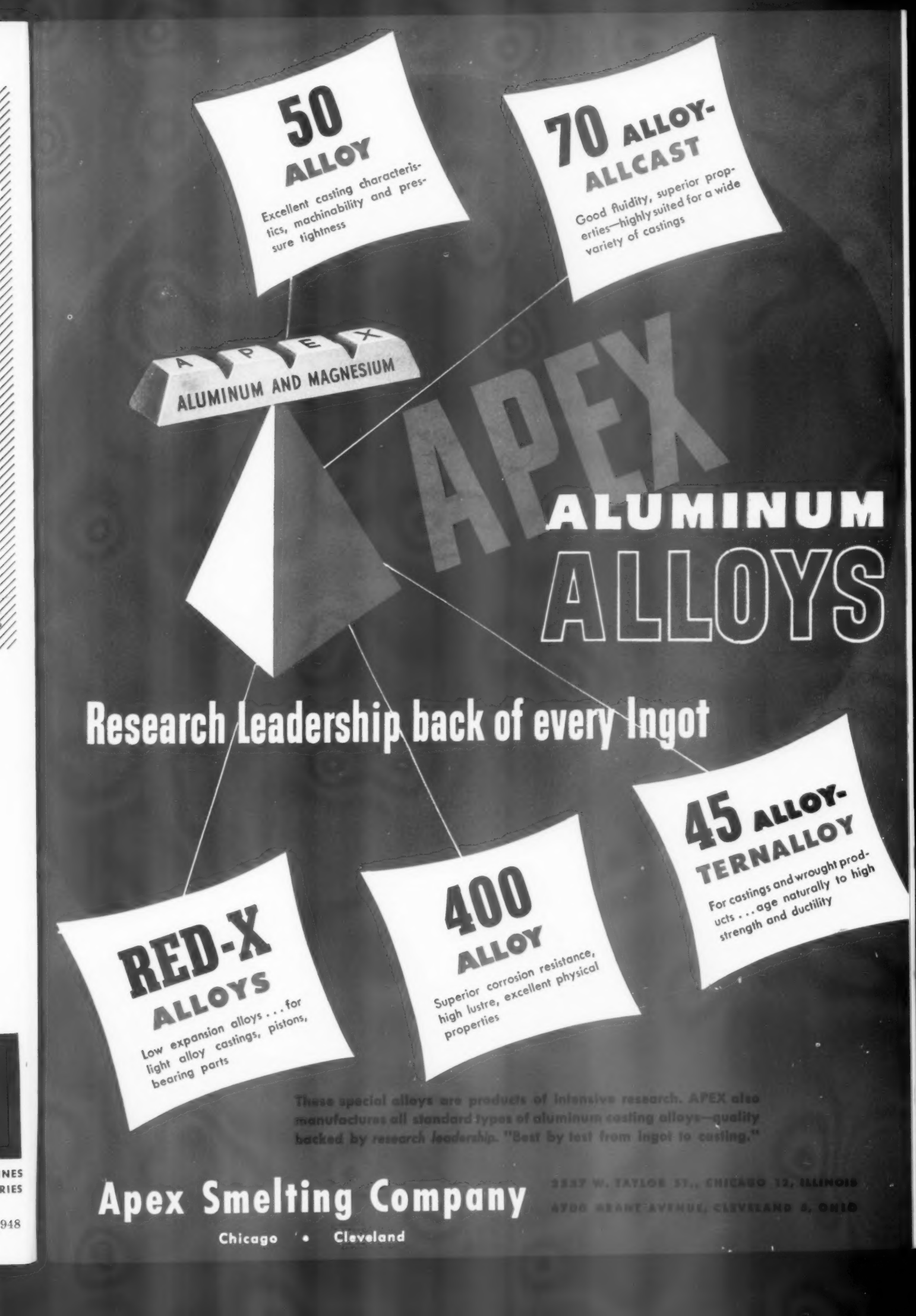
The foreman likes the Steel Clad Grinder because it remains on the line, instead of being in the repair shop. The piece worker likes it because it increases his output, without increased effort.

Write for Bulletin SP-2068

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES


50
ALLOY
Excellent casting characteristics, machinability and pressure tightness
70 ALLOY-
ALLCAST
Good fluidity, superior properties—highly suited for a wide variety of castings
APEX
ALUMINUM AND MAGNESIUM
APEX
ALUMINUM
ALLOYS
Research Leadership back of every Ingot
45 ALLOY-
TERNALLOY
For castings and wrought products . . . age naturally to high strength and ductility
400
ALLOY
Superior corrosion resistance, high lustre, excellent physical properties
RED-X
ALLOYS
Low expansion alloys . . . for light alloy castings, pistons, bearing parts
These special alloys are products of intensive research. APEX also manufactures all standard types of aluminum casting alloys—quality backed by research leadership. "Best by test from ingot to casting."
Apex Smelting Company
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Make it better with GRAY IRON

Many a manufacturer has been led astray by the theory that because something is newer it must be better.

For example, certain products or components which are naturals for Gray Iron are made of other metals less advantageous for the purpose.

Maybe it's because gray iron castings have been around so long, some people have forgotten what an extraordinary array of advantages they offer. Then, too, many potential users—and even product designers—are not aware of the great improvements in gray irons in recent years.

Send for free booklet, "GRAY IRON—Its Mechanical and Engineering Characteristics and Details for Designing Cast Components".

In forthcoming messages in this series, each of the following advantages will be illustrated:

Castability	Corrosion Resistance
Rigidity	Durability
Low Notch Sensitivity	Vibration Absorption
Wear Resistance	Machinability
Heat Resistance	Wide selection of mechanical properties

GRAY IRON—second largest of the metal-working industries.

GRAY IRON FOUNDERS' SOCIETY, INC.

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The high-temperature, corrosion-resistant alloys, of which aircraft turbo superchargers are made, are easily and quickly joined by the UNIONMELT welding process.

The UNIONMELT Process

a fast, easy way to join plain and super alloys

The UNIONMELT process of welding electrically, without flash, glare, or spatter, produces sound, high quality welds of smooth, clean finish—welds which while hot are protected by a molten covering of fused special welding composition applied in granular form. When cool, the fused composition detaches itself and no chipping or peening is required to finish the weld.

The high welding currents, characteristic of the process, produce uniform welds of extremely deep penetration at high speeds. In welding alloy steels and non-ferrous metals, special welding rod and sometimes special types of the granular welding material are used to produce weld metal of the composition and characteristics required.

LINDE Engineering Service can help you whether your job involves UNIONMELT welding or any other of the numerous LINDE methods for joining, cutting, forming or treating metals.

Call or write any LINDE office for a copy of booklet F-6077, which fully describes UNIONMELT welding.

Linde
Trade-Mark

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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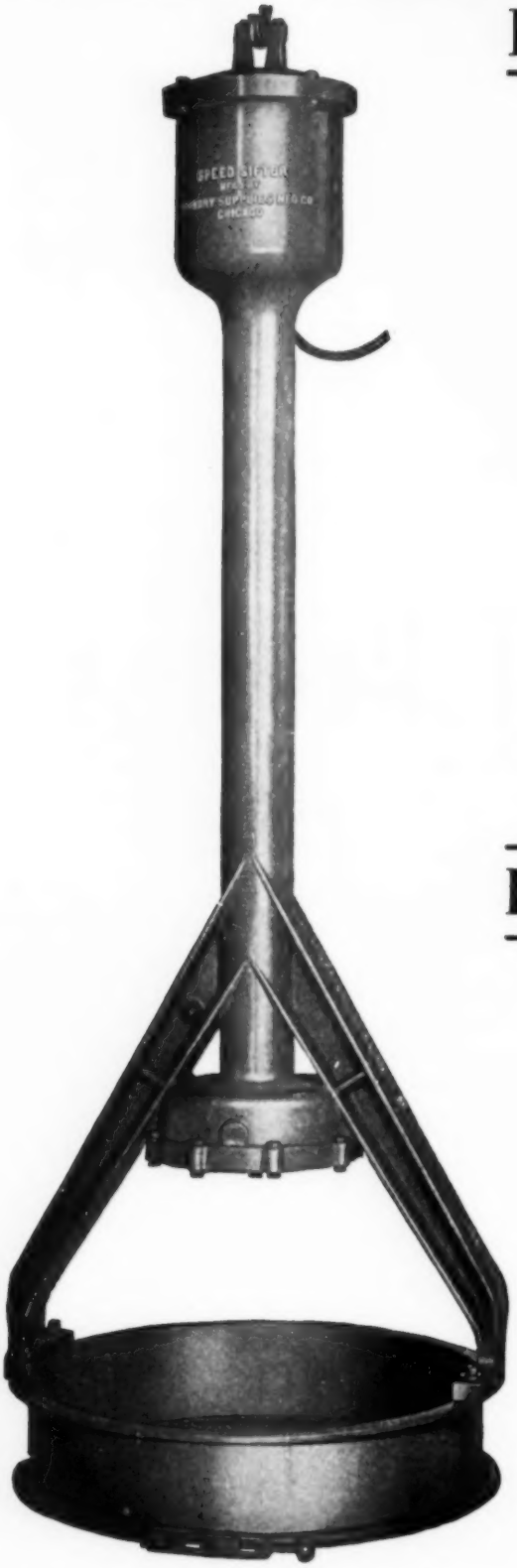
The terms "Linde," and "Unionmelt," are registered trade-marks of The Linde Air Products Company

Increase Production

with the

ROTOPLANE SPEED SIFTER ★ RED ELECTRIC VIBRATORS



ROTOPLANE SPEED SIFTER

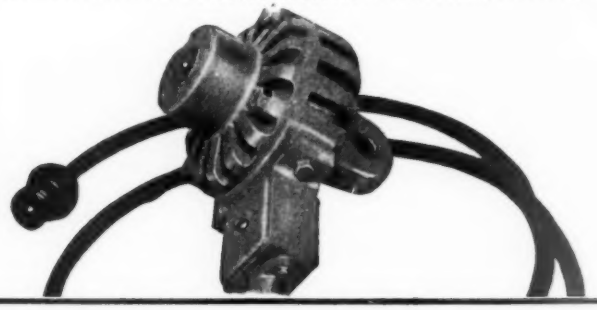
The ROTOPLANE Speed Sifter is an *improved* sand riddle of much greater capacity and much longer life. One size and type serves all purposes in the foundry—does *all* your sifting more quickly and economically.

It is easily handled by one man, weighs approx. 90 lbs., is 62 in. high overall. The one-piece frame of tough aluminum alloy makes for a remarkably effective vibration. Its smooth, free, rotary action vastly increases bearing life; all bearings grease packed. All mechanism of the ROTOPLANE is *completely* enclosed—no bearings or activating parts of any kind exposed to dust and grit.

The Quick-Change Sieves are instantly interchangeable, mounted in smooth, flat steel ferrule, with 20-inch diameter clear sifting area. No jagged edges to tear workers' hands, no storage problem.

$245.00 f.o.b. Chicago—complete with cable, safety ground wire. Standard 1/3 h. p. motor, 110 volt, 60 cycle, single phase and 220 volt, 1 or 3 phase.

UNIVERSAL FREE - WHEELING RIDDLE equipped with motor as above $225.00



RED ELECTRIC VIBRATORS

True-to-pattern castings make satisfied customers . . . more repeat business. Increase your production and castings quality with RED Electric Vibrators. Sturdy, dustproof, lowest operating cost (electricity does not freeze). Unequaled for consistent year-'round results in foundries all over the world.

(All Prices f.o.b. Chicago)

No. 1—Light match plate work	$12.00
No. 2—Medium match plate work	15.60
No. 5—Heavy match plate, tub and bench work	20.40
No. 9—Machine and heavier work	28.80

Third (ground) wire per U. S. Govt. code—furnished with No. 9 at no extra cost; $1.20 extra with Nos. 1, 2 and 5 vibrators.

KNEE SWITCHES for operating Red Electric Vibrators: Single pole $5.00, Double pole $6.50.

FOUNDRY SUPPLIES MANUFACTURING CO.

2221 Orchard Street **Chicago, Illinois**

CABLE ADDRESS: "ROTOPLANE CHICAGO"

IN MODERN *FOUNDRY* SERVICE . . .

SWINDELL

ELECTRIC ARC
MELTING FURNACES

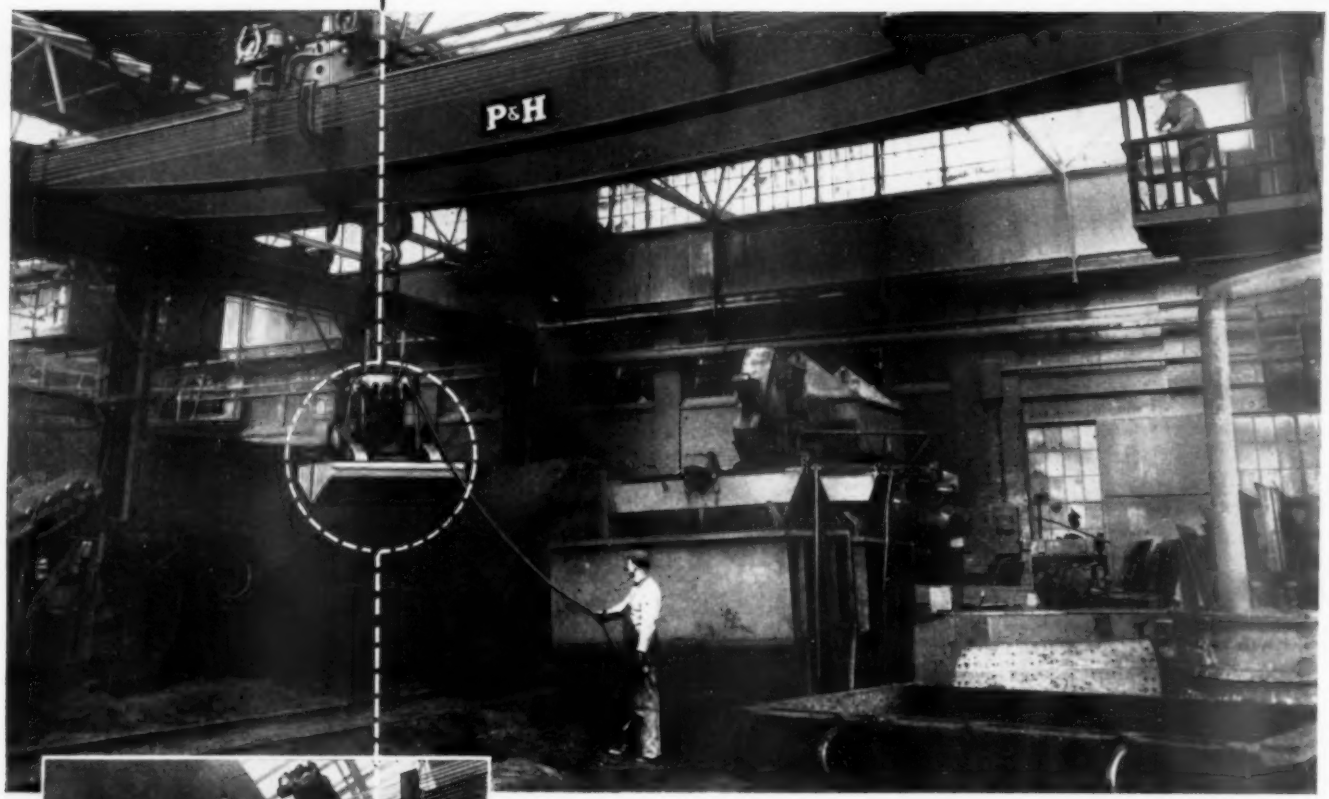
provide
MORE TONS PER HOUR
through-

- BETTER RESPONSE TO CONTROL
- WIDER VOLTAGE SELECTION to suit melting problems
- SIMPLICITY OF DESIGN
- RUGGED CONSTRUCTION

Let us discuss your individual problem!

SWINDELL-DRESSLER CORPORATION
Designers and Builders of Modern Industrial Furnaces
PITTSBURGH 30, PA.

P&H SINGLE LINE GRAB BUCKETS



a *"Natural"* in foundry service!

In a matter of seconds you can attach the P&H Single Line Grab Bucket to your crane hook and it's ready to go to work. It's as simple as that — and it provides easy, accurate one-man operation. It works fast, bites deep, picks up clean.

Here's the fast, easy way to handle all kinds of bulk materials — sand, coke, crushed stone, cinders, etc. It's widely used to unload cars, dig pits, fill flasks, etc. A "natural" for foundry use if there ever was one.

Available in capacities from ½ to 2½ yds. Write for all the facts about it. Ask for Bulletin C-27.

P&H

GRAB BUCKETS
4405 West National Avenue
Milwaukee 14, Wis.

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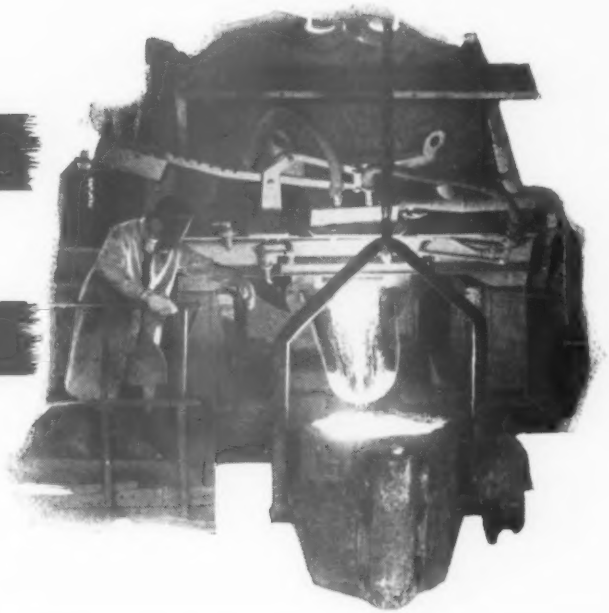

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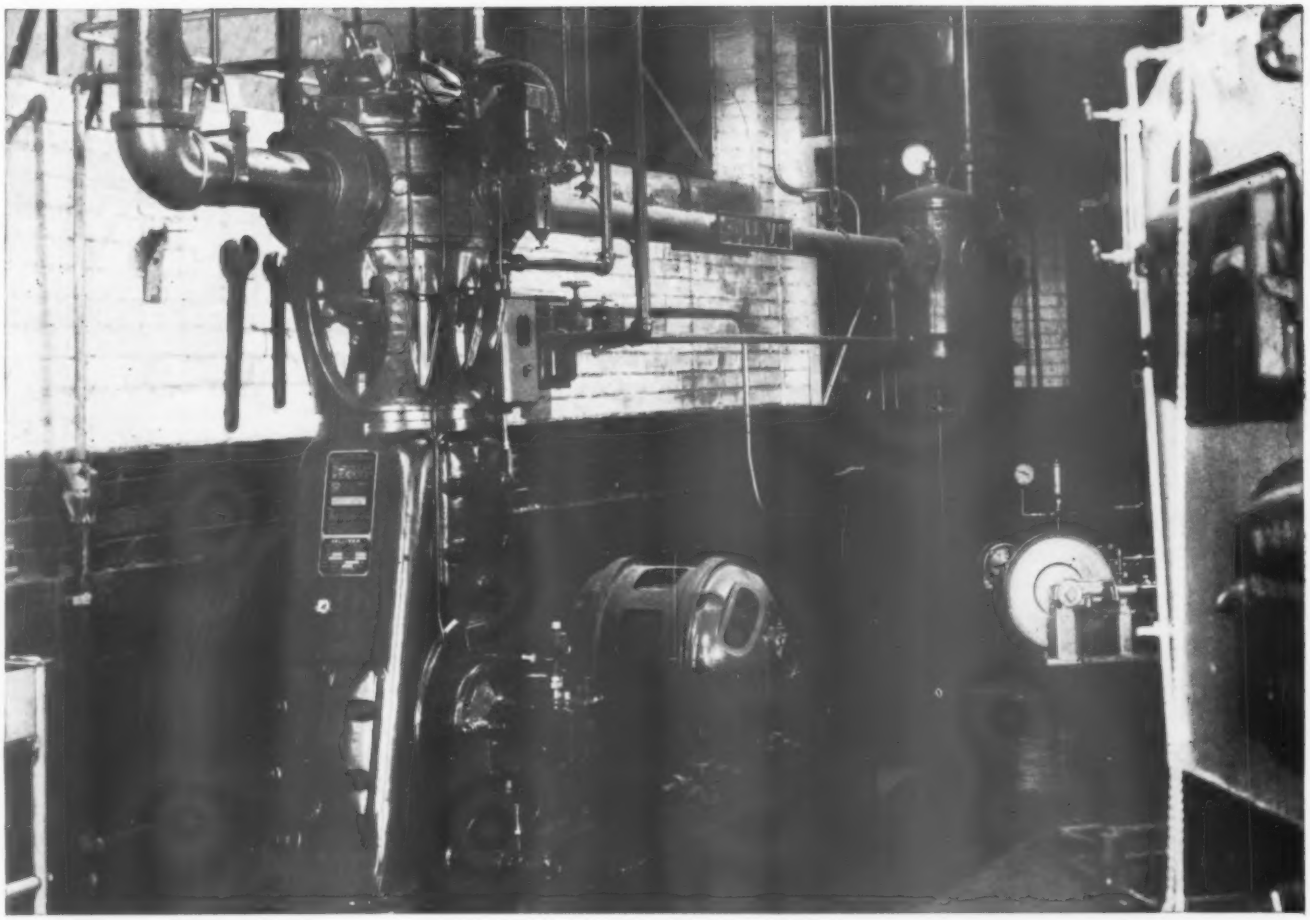

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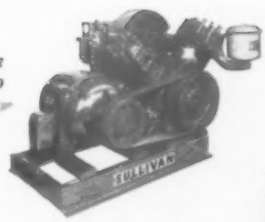

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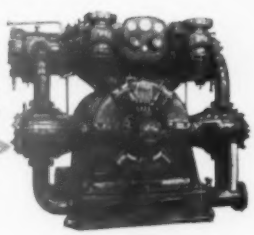

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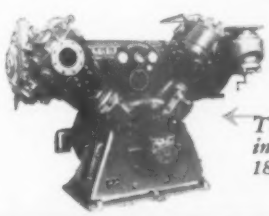

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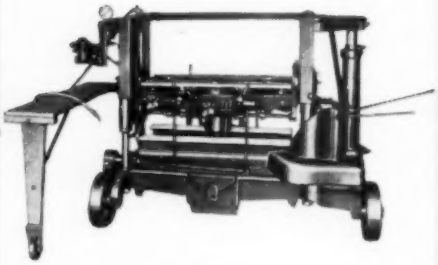
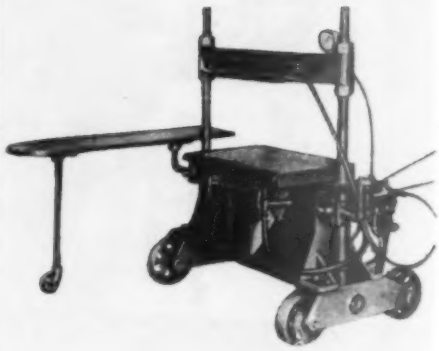


Jolt Rollover Squeeze Draw
4 sizes



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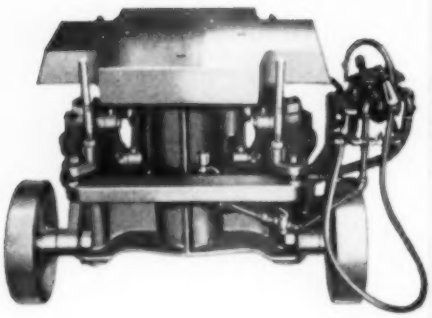

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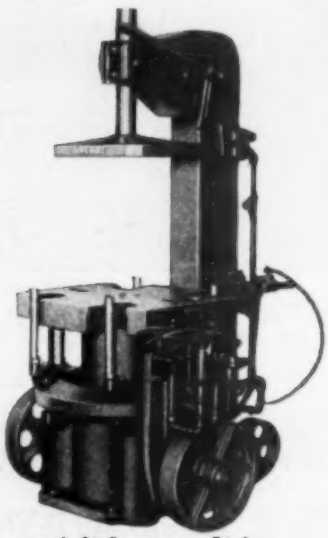

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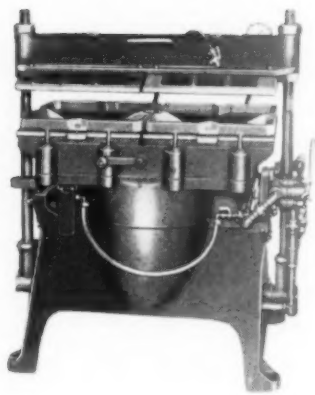
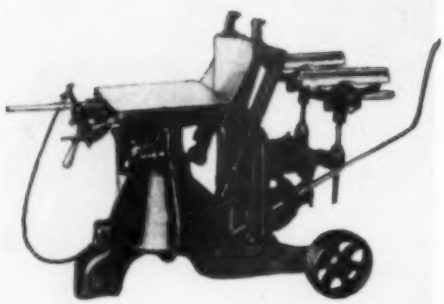


Multiple Molding
3 sizes



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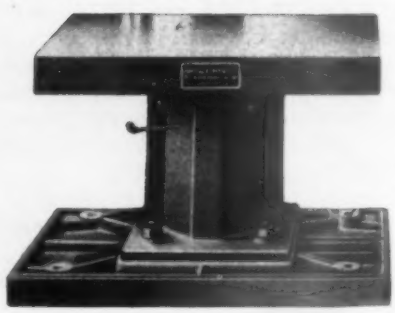


Plain Jolt
6 sizes

More Economies Needed In Castings Production

RECENT reports from various sections of the country indicate some easing in the demand for certain types of castings, and a consequent reduction in backlogs. While this situation is not general, the trends are being watched closely by numerous foundrymen.

Slowing down of orders may have resulted from a general uneasiness accompanying the national election, or it may mark the approach of the period of intense competition which has been heralded frequently the last few years. Time alone can reveal the actual trends.

Regardless of the cause or the possible temporary character of this slight lull, the problems now facing numerous plants in the industry emphasize strongly the need for finding and applying further economies in the production of castings. Perhaps the entire foundry industry cannot expect to operate indefinitely on the high production plateau of the early postwar period, and therefore, sooner or later, ways and means must be developed to operate profitably on a somewhat smaller volume of business.

What are some of the factors that might be considered as a means of shaving production costs? These can be summarized under the following headings: Modernization and mechanization; application of better practices; elimination of waste; and higher production per employee.

Recently the foundry industry has broken all records in the matter of modernization and mechanization, but much remains to be done. If a foundryman expects his foundry to prosper in the future, the possibility of reducing production costs through the further application of new machines or the revamping of present equipment should be given careful study.

As a means of producing castings more economically, many of the newer improvements in foundry practice need to be applied to individual plants. Causes of waste should be determined and steps taken to see that they are eliminated. Technical and statistical controls should be applied to the variables of the industry as a means of cutting losses and stabilizing costs.

Although these factors are of great importance, the success of any effort to reduce costs depends to a large extent on the willingness of workers to help management in the project. If workers understand the relationship of the quality and price of castings to the ability of the company to stay in business and provide security of employment, better co-operation may result. Some foundrymen are being exceptionally successful in this phase of personnel relations.

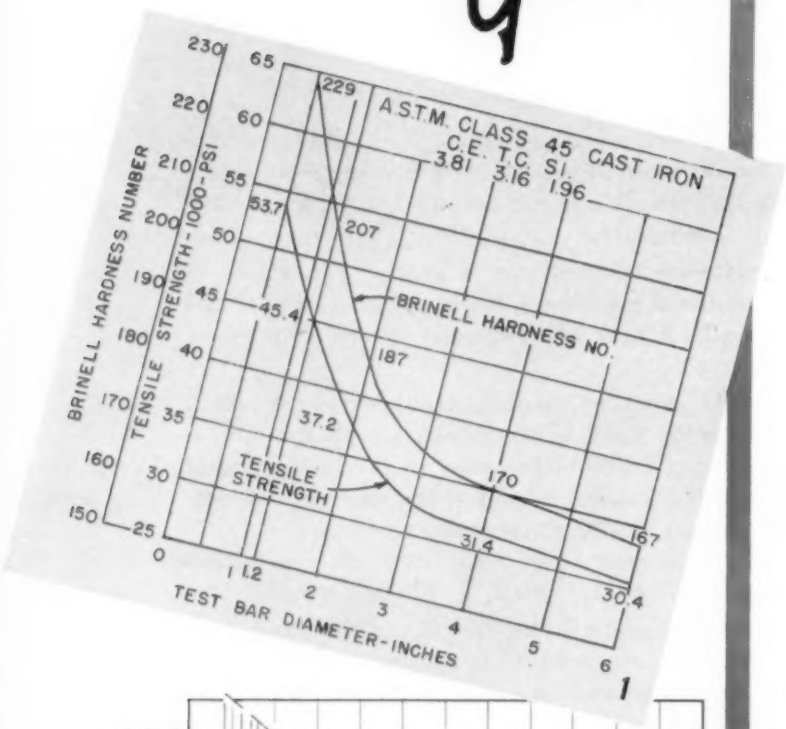
Frank G. Steinebach
Editor

THE FOUNDRY
WHEREVER METALS ARE CAST

By JACK H. SCHAUM

Gray Iron Transverse

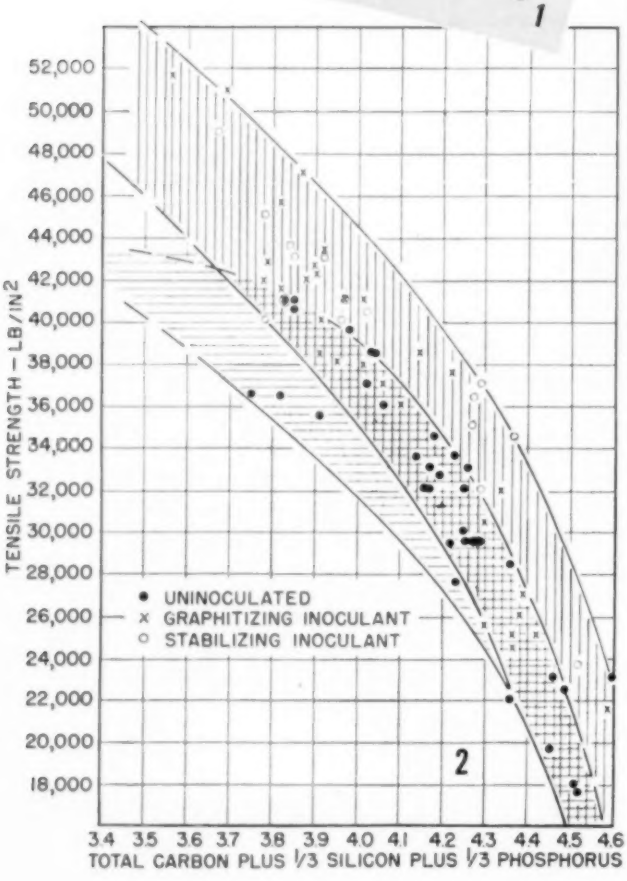
The Technical Department of the Gray Iron Founders' Society has sponsored publication of this paper in view of the fact transverse bars and tensile specimens turned from them are most widely accepted as a means of determining gray iron quality. The author, formerly research metallurgist, Naval Research Laboratory, Washington, where this research was conducted, now is research metallurgist, experimental foundry, National Bureau of Standards, Washington

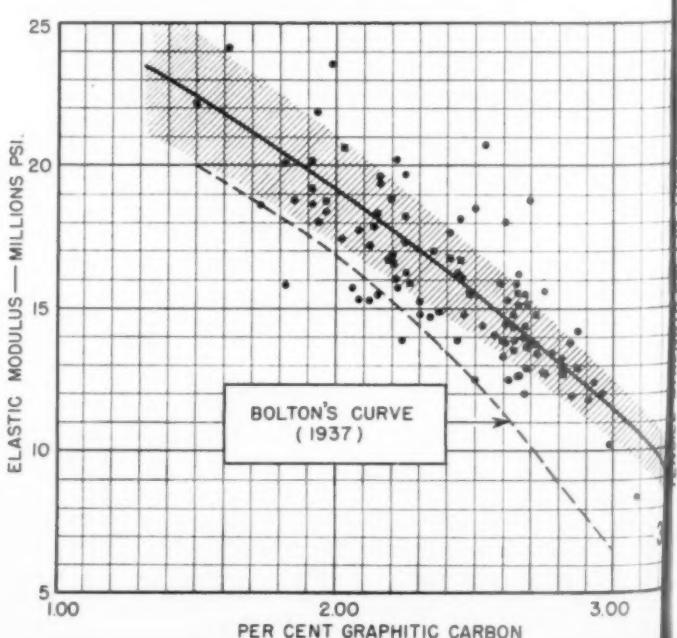


TEST bar specifications have always been a subject of interest to foundrymen. This report describes the common defects found in commercial transverse test bars and the techniques developed at the Naval Research Laboratory for improving the casting and testing of such bars. The tensile strength as affected by the size of the specimen and its location in a casting was also studied.

The objective of the work was to reveal the common defects occurring in transverse test bars made by commercial foundries and to develop improved techniques for making and testing the bars.

Since test bars and physical testing present problems common to most metal casting industries, considerable work has been done on this subject. Many of the investigations have been published and some of the more important aspects of these studies closely





Test Bars

related to the subject of this work serve well as an introductory background.

Cast iron is a "section sensitive" material whose physical properties are greatly influenced by cooling rate. This has been recognized by specifications designed to match the diameter of the test bar to the controlling section of the casting. An example of the effect of section size may be seen in Fig. 1, reproduced from a paper by Henry C. Winte[1], in which it is seen that tensile strength and brinell hardness decrease with increasing size of test bar.

Rother and Mazurie[2] related the tensile strengths of various diameter bars in the following manner:

Soft Iron—

Tensile strength of 1½" bar is 82% of 1" bar.
Tensile strength of 2" bar is 72% of 1" bar.
Tensile strength of 2½" bar is 62% of 1" bar.
Tensile strength of 3" bar is 55% of 1" bar.

Machinery Iron—

Tensile strength of 1½" bar is 90% of 1" bar.
Tensile strength of 2" bar is 84% of 1" bar.
Tensile strength of 2½" bar is 76% of 1" bar.
Tensile strength of 3" bar is 75% of 1" bar.

An investigation of transverse or arbitration test bars made at the Bureau of Standards by Krynitsky and Saeger[3] showed that vertically cast bars, particularly those which were bottom-poured, were much more uniform in diameter than bars cast in horizontal or inclined molds. Phillips[4], comparing horizontal and vertical pouring of pairs of transverse test bars, found 60 per cent of the horizontally cast bars were stronger than the vertically cast ones. None of the horizontal bars were defective, while 8 per cent of the vertical bars were. The Institute of British Foundrymen[5] recommended that arbitration bars be poured in oil or dry sand with a distance between individual bars in the same mold equal to at least 1½ times the diameter of the bar.

The physical testing of the arbitration bar has presented many problems in technique and interpretation of results. The Bureau of Standards devised a technique in which the deflection was measured with a micrometer telescope.[6] MacKenzie and Donoho[7] examined the effect of the length of the transverse span on modulus of rupture and modulus of elasticity and found that with decreasing span, the modulus of rupture increases whereas the modulus of elasticity decreases.

Gray iron does not follow Hooke's law according to which stress is proportional to strain. The stress-strain curve obtained in transverse testing is not a straight line but a curve with a different value for modulus of elasticity at each load level. This deviation from a straight line relation is caused by plastic flow which takes place almost entirely in the first loading cycle. For example, if an arbitration bar is alternately loaded and unloaded to a stress below its breaking point, the strain produced after the first loading is essentially elastic. If the load at any time exceeds the previous maximum, however, there will be a plastic deformation for that increment.

Although many of the applications for cast iron do not place the material in tension, its quality is often judged by its tensile strength. Because tensile testing is relatively expensive, considerable effort has been expended toward attempting to relate that property with chemical analysis, brinell hardness, or transverse strength. For example, Barlow and Lorig[8] prepared a number of charts, such as the one shown in Fig. 2, which correlated tensile strength with carbon equivalent (carbon plus 1/3 silicon plus 1/3 phosphorous). These properties are roughly related by a broad band of values. They also found that the ratio of tensile strength to brinell hardness varied with

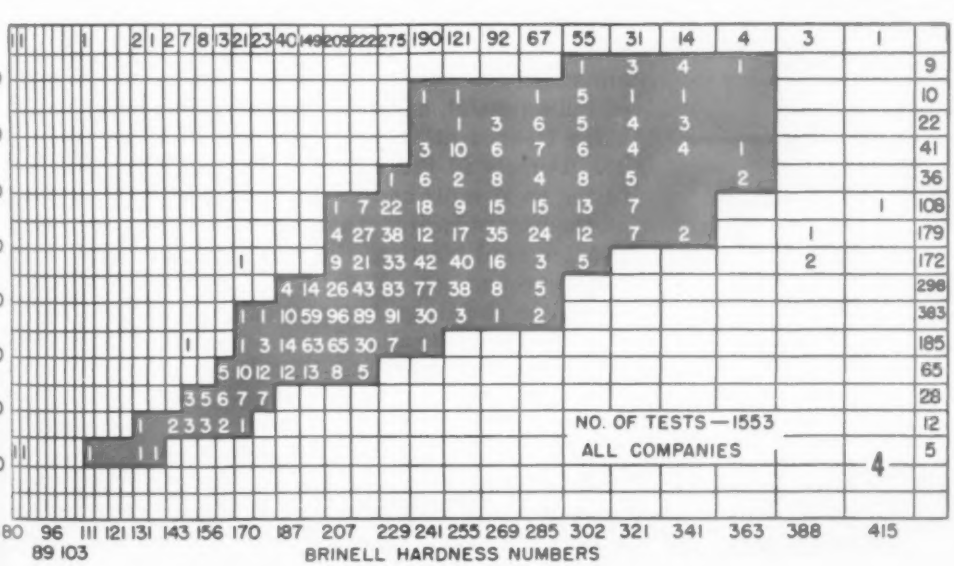
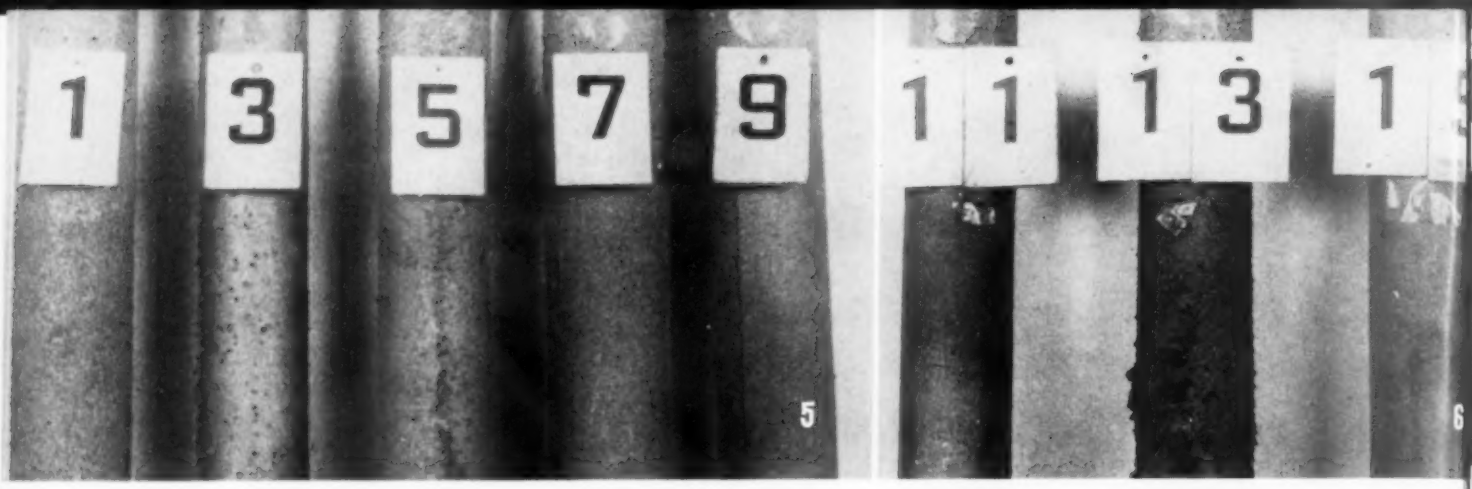


Fig. 1—Effect of section size on tensile strength and brinell hardness[1]

Fig. 2—Correlation of tensile strength with carbon equivalent[8]

Fig. 3—Effect of graphite content on elastic modulus[10]

Fig. 4—Relation between tensile strength and brinell hardness[9]



carbon equivalent.

Recently, MacKenzie plotted the tensile strength versus the brinell hardness of 1553 test specimens[9]. Fig. 4 is a graphic reproduction of his data. As the tensile and hardness values increase, the relation tends to spread over a wider area. The author developed the following general relation from the average values:

Tensile strength = (1.82) $(Bhn)^{1.85}$ for brinell impressions ranging from 3.2 to 5.8 mm.

Theorizing that the properties of cast iron are dependent to an important degree upon graphite, Herzig[10] plotted the per cent graphitic carbon versus the elastic modulus, as shown in Fig. 3. The solid line represents the average relation between graphitic carbon and elastic modulus obtained from 180 transverse bend tests. The shaded area represents a ±10 per cent error band which includes 70 per cent of the results.

Testing of Arbitration Bars—Twenty-nine standard arbitration bars were obtained from 13 representative commercial foundries through the cooperative efforts of the Gray Iron Founders' Society. These bars were approximately 1.2 inches in diameter by 21 inches long.

After sand blasting, the surface of these bars was inspected and photographed. Figs. 5 to 8 show the surface condition. Pertinent information on the pouring and molding techniques, and surface condition, are listed in Table I. Table II contains the chemical analyses.

The majority of these arbitration bars have surface defects which might materially reduce the physical properties if tested in the as-cast condition. Bars that are rammed in the horizontal position, so that one half is in the cope and the other half in the drag, always have an undesirable fin running the length of the bar along the parting line. This fin may be seen in bars numbered 9 and 23.

Considerable evidence of metal penetration into the sand is apparent in the vertically poured molds. This defect is usually the greatest at the bottom of the bars, probably as a result of the static pressure developed by the tall column of metal, and gradually diminishes toward the top. (Observe bars numbered 13 and 25.) The walls of the vertically poured molds are subject to severe erosion by the impinging stream of falling metal, and this action often results in sand being trapped at the metal surface as in bar number 23. Defects in the patterns are usually transferred to the mold walls and give the type of surface visible on the bars numbered 5 and 23.

After sand blasting, the bars were inspected by x-ray for soundness. There was very little evidence of centerline shrinkage but considerable entrapped sand was revealed. Smaller defects than can be observed in radiographs of the 1.2-in. thick section can be revealed by radiographs of transverse discs ¼ to ½-in. thick. The results of this type of examination may be seen in Fig. 11. These transverse slices, ½-in. thick, are four out of a total of thirty such slices from a bar which was bottom poured. The slices shown are from the lower part of the bar, where

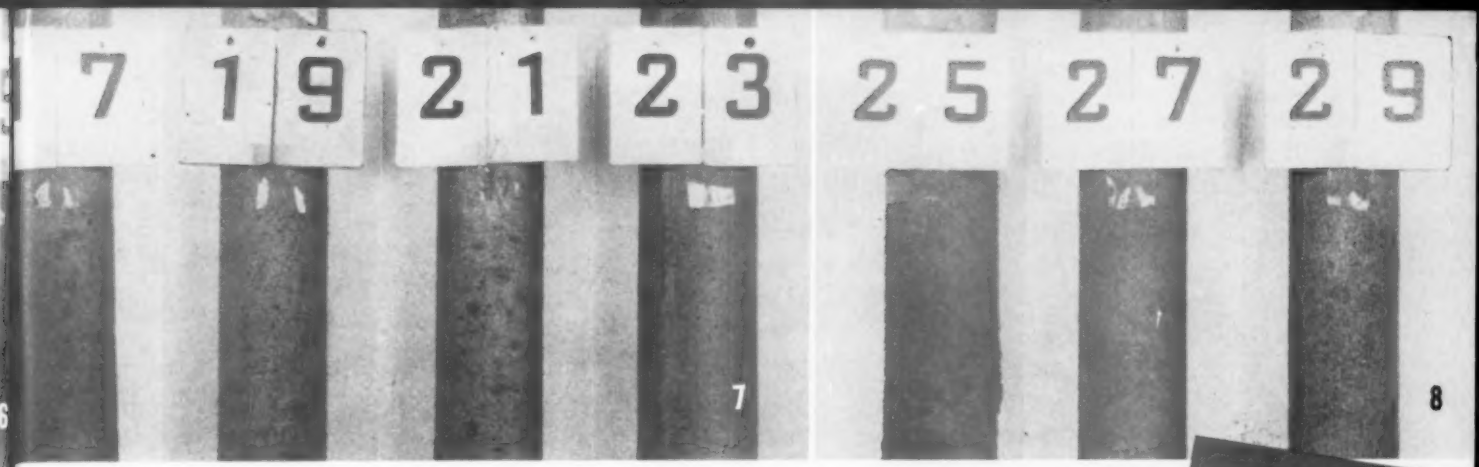
TABLE I—Industry Arbitration Bars

Arbitration Bar Number	Pouring Position	Sand	Observations of Surface Finish
1	Vertical	Dry sand	Rough surface due to coarse sand
3	Vertical	Oil sand core with silica wash	Bar undersize due to wash & covered with globules of metal as if wash contained air bubbles. Surface smooth
5	Vertical	Dry sand mold (core)	Roughness or penetration. End of pattern burred
7	Horizontal	Green sand	Smooth. Shows effects of fine sand
9	Horizontal	Green sand	Smooth. Shows effects of fine sand
11	Vertical	Black sand—Coat of Blacking—oven dried	Smooth
13	Vertical	Dry sand mold	Rough. Penetration due to soft ramming
15	Vertical	Green sand	Smooth
17	Horizontal	Green sand	Smooth with a few droplets of penetrated metal.
19	Vertical	Oil sand core	Rough—slight penetration
21	Vertical	Oil sand core	Veins and slight roughness
23	Vertical	Dry sand core—washed	Horizontal fin-pattern defects visible—some dirt
25	Vertical		Very rough—soft ramming
27	Vertical	Dry sand with wash	Slightly rough. Wash not very effective
29	Horizontal	Core mold	Good surface for a core

TABLE II—Chemical Analyses of Arbitration Bars

(Per cent)

Bar Number	C	Si	Mn	S	P	Ni	Mo	Cr	
1	3.29	1.79	.65	.10	.15				
3	3.07	2.20	.84	.111	.088	1.38		.65	
5	3.17	1.77	.70	.078	.082	1.65	.69	.10	
7	3.43	3.00	.65	.091	.492				
9	3.43	3.00	.65	.091	.492				
11	3.57	1.65	.30	.097	.556				
									(.05-V
13	3.72	2.14	.89	.057	.096		.35	.43	(.19-Ti
15	3.18	1.48	1.23	.079	.056				
17	3.36	2.25	.67	.113	.204				
19	3.39	2.20	.82	.131	.124	.37	.32	.24	
21	3.39	2.20	.82	.131	.124	.37	.32	.24	
23	3.52	2.66	.66	.106	.316				
25	3.52	2.27	.83	.097	.140				
27	3.26	2.08	.90	.072	.37				
29	3.14	1.69	.43	.075	.114				



shrinkage was observed.

After x-ray examination the arbitration bars were subjected to transverse bend tests, the results of which are summarized in Table III. The maximum and minimum diameters of the bars were measured at the point of fracture with a micrometer caliper. The breaking loads and total deflections were then corrected to the average diameter with the standard correction factors listed in Table II of the ASTM Standard Specification for Gray Iron Castings, A 48-46.

The tendency for horizontally cast test bars to have an elliptical cross section is apparent in bars numbered 7, 9, and 17. The difference between the maximum and minimum diameters of these three bars ranged from 0.050-in. to 0.101 in. The vertical bars had more consistent dimensions, the usual difference in maximum and minimum diameters being 0.010 to 0.020 in.

From each of the broken bars four tensile test specimens were cut as shown in Fig. 9. A summary of the results is given in Table IV. Column 4 shows for each arbitration bar the maximum percentage deviation in tensile strength of any one specimen from the average of the four specimens. This deviation varied from a low of 1.2 per cent to a high of 13.3 per cent. The actual differences between the maximum and minimum tensile strengths varied from 900 to 6200 psi. Thus, the choice of the location of the test bar may very well make the difference between a casting being accepted or rejected.

Referring to Fig. 9, the strongest metal was usually found in position D, with C, B, and A successively weaker. Of twelve bars, nine had the strongest metal in position D and all twelve had the strongest metal in either C or D. Thus it may be concluded that the lower part of the bar contains the metal with the best tensile properties.

The relation of trans- (*Please turn to page* 216)

Figs. 5, 6, 7, 8 — Surface condition of commercial transverse test bars

Fig. 9—Location of tensile bars cut from standard arbitration bar

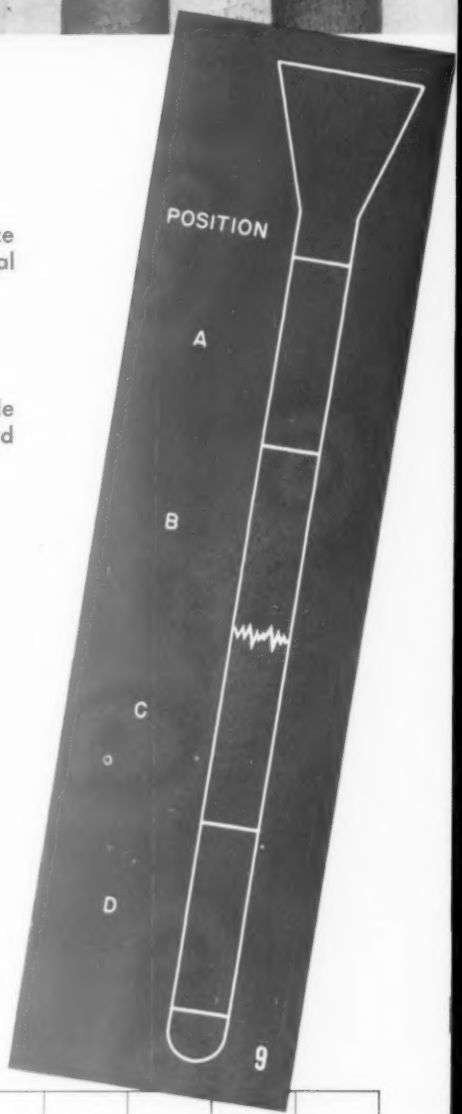


Fig. 10 — Transverse strength vs maximum and minimum tensile strength of each arbitration bar

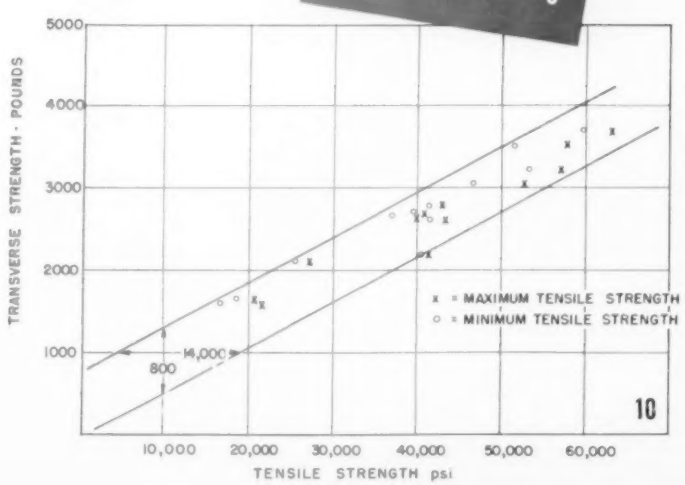
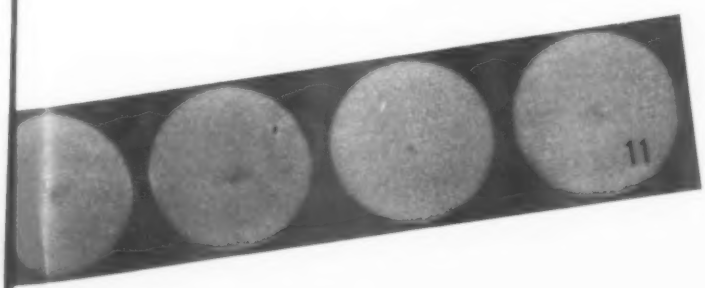


Fig. 11 — Radiographs of transverse disks sliced from test bar



Degassing NONFERROUS

By E. KURZINSKI
Development Engineer
Linde Air Products Co.
Newark, N. J.

Fig. 1—Manual degassing operation on a pit type crucible furnace

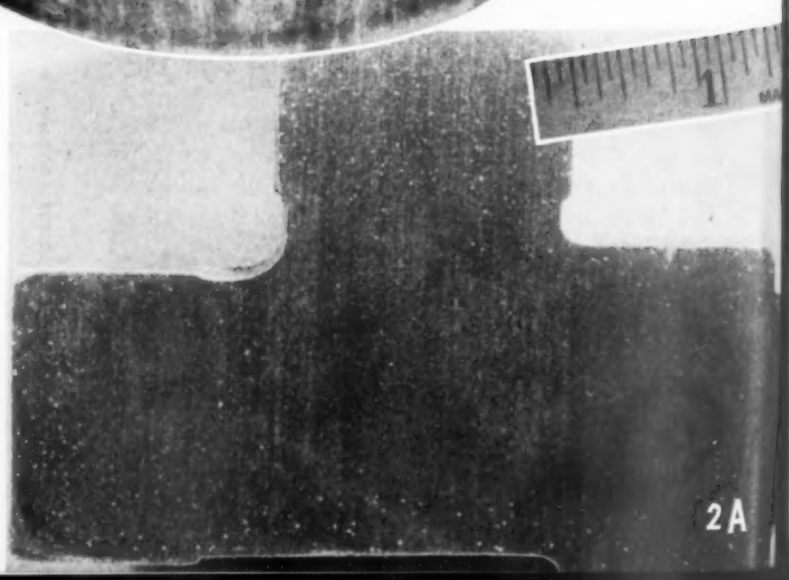


Fig. 2A—Untreated specimen of aluminum alloy (4.5 per cent Cu, 0.8 per cent Si, balance Al). Fig. 2B shows specimen of same alloy nitrogen-degassed at rate of 25 cu ft per ton of metal

Fig. 3—Fluxing tubes. One in center has a piece of porous graphite threaded onto a standard graphite fluxing tube (top). Unit at bottom employs radial holes instead of porous material in end of the tube

g METALS

FLUSHING molten metal with an inert gas, either alone or in conjunction with a solid flux, aids in the production of sound nonferrous castings. It is particularly effective on aluminum-base and copper-base alloys. When properly applied and controlled, the flushing technique developed for these metals will remove the gases which lead to porosity. In addition, cleaner castings are obtained because oxides and other nonmetallic inclusions are also removed, by floating them to the surface where they are trapped in the dross. In some instances, the use of the degassing process will offset the harmful effects of oily scrap in the charge.

It should be understood, however, that this process is not a cure for all foundry troubles. If porosity exists only in selective areas of a casting, the cause is probably not dissolved gases, and flushing will not be of any benefit. Nor will flushing correct for excessively damp sand in the mold, inadequate venting, hard ramming, inadequate risers, poor gating, or carelessness in any phase of foundry practice. But to the foundryman who is already employing good technique, it is an effective tool which can enable him to eliminate one source of unsoundness in his product.

Sources of Gas Porosity—In general, two types of gas porosity are found in metals:

1. Porosity due to the evolution of dissolved gas as the metal solidifies. This type of porosity is explained by the fact that the molten metal has a much greater solubility for a gas such as hydrogen than has the solid metal. If given the opportunity, therefore, molten metals will absorb large quantities of hydrogen, the major portion of which is released during solidification. If the metal is cooled rapidly enough—as is usually the case—the hydrogen evolved is trapped by the solidifying metal which thereafter has porosity in direct proportion to the amount of hydrogen it has retained.

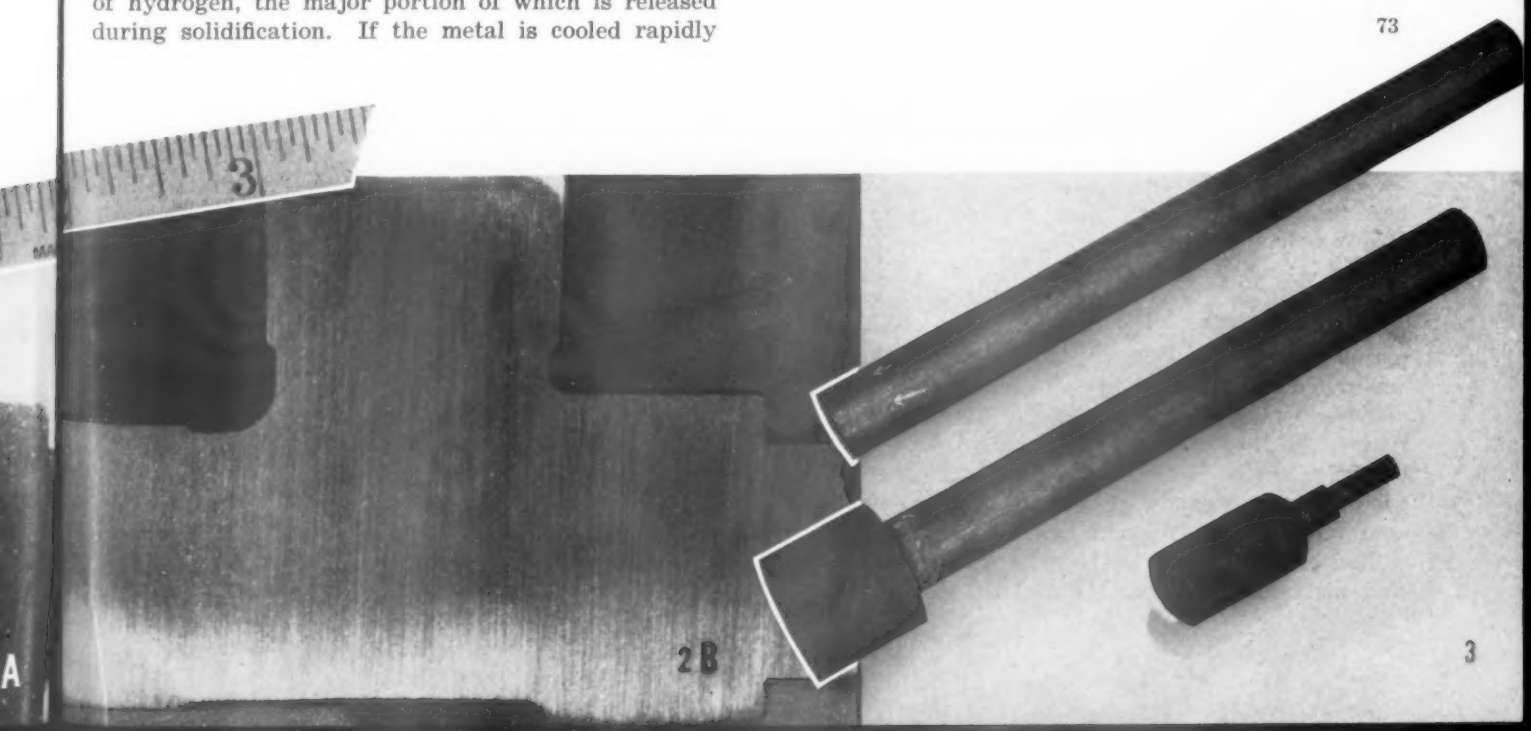
2. Porosity due to the formation of gas by the chemical reaction of oxygen or an oxide with a gas or a gas former, both of which are dissolved in the melt. This reaction normally takes place during solidification. Typical of such a reaction is the evolution of sulphur dioxide during the solidification of tough pitch copper in which the sulphur and oxygen contents have been adjusted by the refiner to get:

$$2\,Cu_2O + Cu_2S = 6\,Cu + SO_2.$$

Both types of porosity can originate in either the solid or the liquid phase of the metal; that is, both phases will dissolve gas, and the reaction which results in the formation of gas can occur in either phase. Flushing with an inert gas will prevent the porosity described in (1) by removing the dissolved gases from the melt, but no amount of flushing gas will overcome the porosity caused by the reaction described in (2). However, in copper-base alloys containing an effective deoxidizer such as phosphorus, zinc, aluminum, manganese or silicon, the oxide reaction does not occur, and the porosity due to dissolved gases can again be eliminated by flushing with an inert gas.

This article is primarily concerned with the elimination and prevention of only that porosity in metals which is due to the presence of dissolved gases, and with the improvement in the soundness and cleanliness of cast metal through the removal of oxides and other inclusions.

Most investigators agree that the gases causing porosity in cast metals are principally hydrogen, sulphur dioxide, carbon monoxide, carbon dioxide and oxygen—with hydrogen the worst offender. In some copper-base alloys, a combination of hydrogen and oxygen often causes porosity, possibly because the two gases unite to form water vapor. Although hydrogen can be added to molten metal by bubbling the molecular gas through it, it is generally agreed that atomic hydrogen will go into solution much more readily. Such hydrogen becomes available from the products of combustion (*Please turn to page* 142)



MECHANIZES *Malleable Iron Fo*

A LIFE-SIZE bronze statue of Seth Boyden in Newark, N. J., honors the energetic and inventive genius whose experiments and curiosity in the period between 1826 and 1832 led to the discovery of a method for producing malleable iron castings. As with all pioneers exploring new territory he wandered off on a side track. Without realizing it he was witnessing and recording the results of an entirely new process, graphitization of hard white iron to malleableize it, rather than decarburization. His iron had no relation to the whiteheart product he was trying to imitate, had much better properties, a new creation among ferrous metals, blackheart, or American malleable iron. In a comparatively short period the manufacture of American malleable iron was taken up in New York and parts of New England and was established in the Middle West in the early fifties. In New England many plants have been in operation for 75 years. At one site in eastern Massachusetts, malleable iron has been manufactured continuously for over a century.

The bronze statue in Newark shows the apron clad and side-whiskered Mr. Boyden in a reflective mood. The right hand rests on his anvil which artists, newspaper reporters and the general public always associate with every type of metal worker. In the left hand he holds a small malleable iron casting. As a solid and responsible citizen Seth probably would have refused to listen if any soothsayer had told him that within a period of little more than 100 years, 133 malleable iron foundries would be in operation between the Atlantic and the Pacific, and that after a steady rise during the war years, the annual production of malleable iron castings in 1947 had crept up close to 900,000 tons.

He would have been still more skeptical of a prophecy which indicated that foundries are installing mechanical equipment which enables them to increase casting tonnage 25 to 30 per cent, with approximately half the former number of molders. Idle speculation of course, as taught to all rising generations, is a sinful waste of time, but supposing, just supposing that the shade of the late Mr. Boyden was to take a gander around the attractive city of St. Charles situated in the beautiful Fox River valley about 35 miles due west from Chicago, he could

Fig. 1—General view of mold conveyor serving one unit

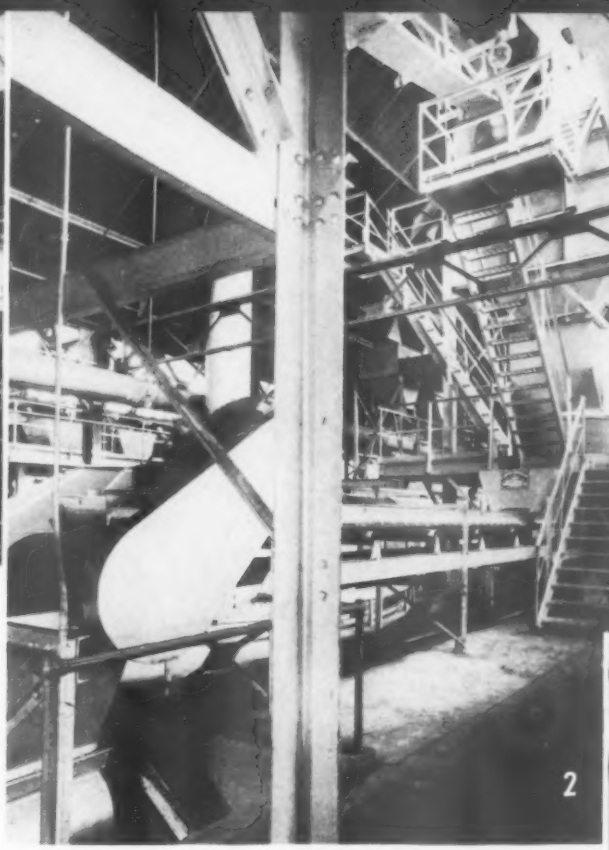


Fig. 2—Prepared sand from the central station is distributed by belt to hoppers over the molding machines

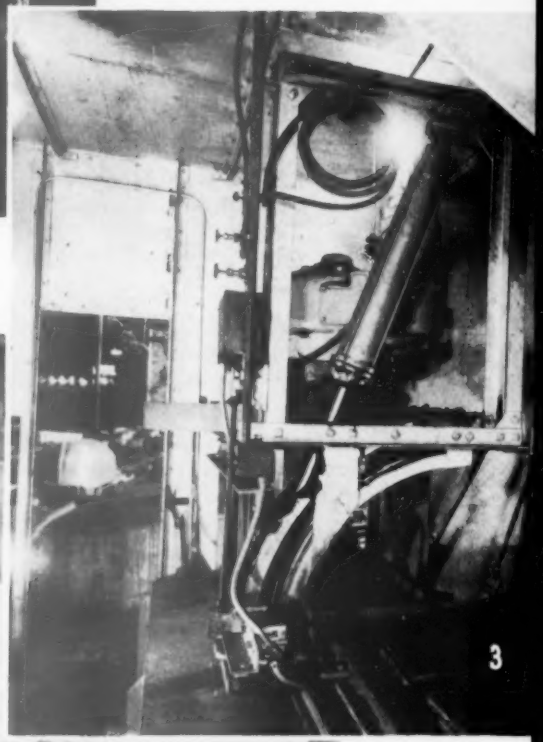
Fig. 3—After passing through the cooling zone the molds are dumped automatically

Fig. 4—Another view of the mold dumping station

Fig. 5 — An elaborate exhaust system removes dust and steam

By PAT DWYER
Engineering Editor
THE FOUNDRY

Foundry

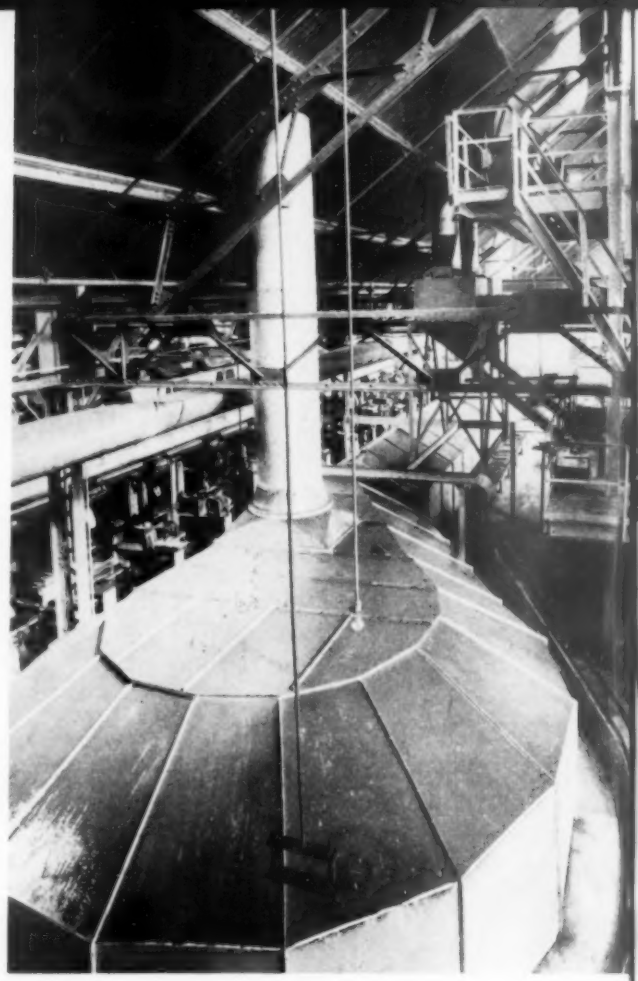


see a shop thoroughly mechanized one year ago where a monthly production of 300 tons of castings has been raised to 425 tons, and where the molding crew has been reduced from 75 to 36. Without any doubt the venerable iron master would have registered the most sincere astonishment and admiration, with maybe a tinge of regret and envy that he was not present in person to see the tree into which his tiny mustard seed had developed.

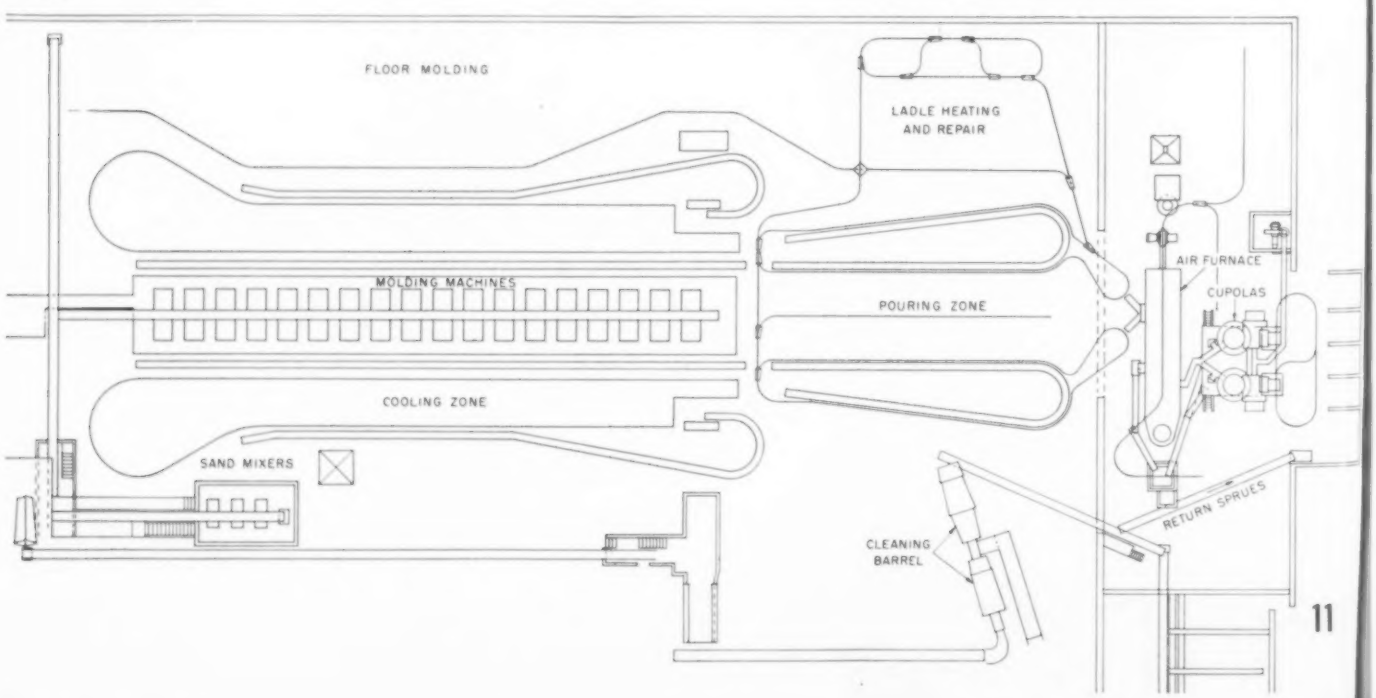
Why is the company known as the Moline Malleable Iron Co., with a plant in St. Charles on the Fox river, when, as every person knows, the city of Moline is one of the quad-city group, Moline, East Moline, Rock Island and Davenport, situated on the Mississippi approximately 100 miles away? The answer is partly for sentimental reasons, and partly for the commercial value of an established name.

Shortly after the Civil war—1869 to be exact—an enterprising survivor of the conflict, one S. W. Wheelock established a small malleable iron plant in Moline. The plant was destroyed by fire in 1893 and rebuilt in St. Charles the same year. This plant also was destroyed by fire in 1915. It was rebuilt immediately and placed in operation by T. S. Fauntleroy, president, R. R. Fountleroy, secretary, and P. C. DeBruyne, superintendent. Mr. DeBruyne died in 1941 and his son, P. C. DeBruyne, was appointed to the position.

At the time of building, the plant represented the most advanced ideas in a form of construction that promised maximum light and ventilation. Walls and roofs did not have to be touched during the recent installation of all the mechanical equipment. Production of castings also was carried on during the changeover period. In the original arrangement, the arrangement commonly observed at the period in all light work foundries, the molding machines were lined up against the walls and the molds were set out on the floor where each molder filled them with metal twice a day. Metal was melted in either one of two 20-ton air furnaces set up at one side of the shop near the center to minimize travel distance for metal.



In the present arrangement as shown in Fig. 1 an area in front of the north wall is still operated in the same manner. The molding machines are close to the wall and the molds are placed on the floor. Miscellaneous jobs and short orders are handled in this section of the foundry. The remainder of the floor space is occupied by mechanical equipment set up as two independent parallel units, with 18 molding machines in each unit. (*Please turn to page* 190)



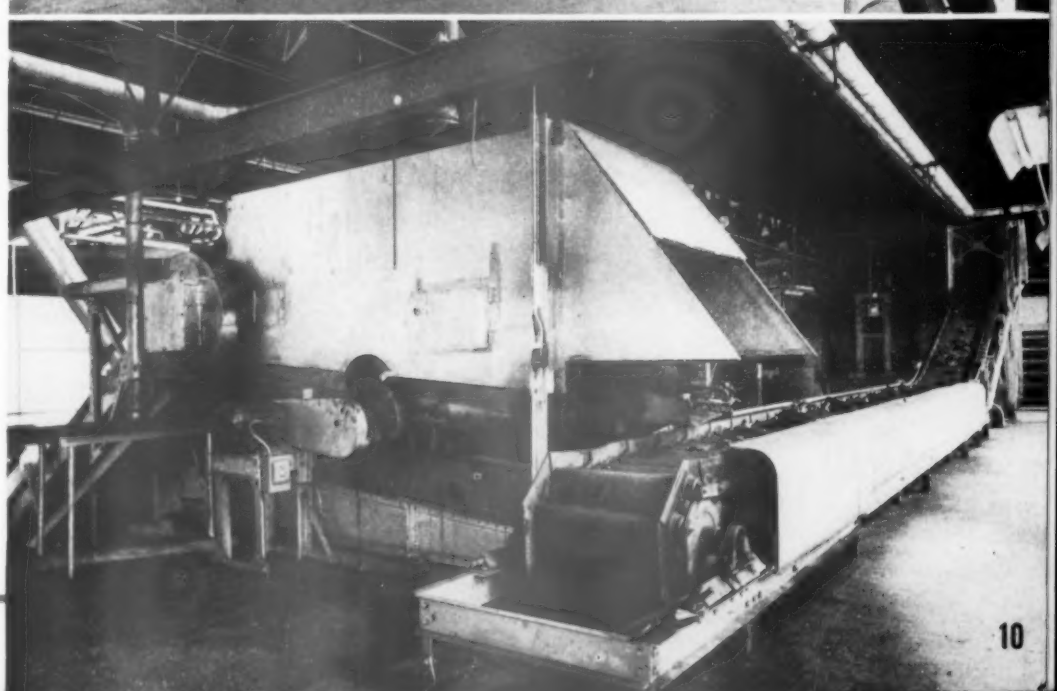


Fig. 6—Between the pouring station and the shakeout the molds pass through a cooling tunnel

Fig. 7—Annealing pots are packed under device at right and dumped under device at left.

Fig. 8—General view of room where castings are sorted

Fig. 9—After leaving the shakeout the castings pass automatically through large tumbling barrels

Fig. 10 — Apron conveyor carries castings from the shakeout to the cleaning room

Fig. 11—General floor layout showing location of the principal features

Gray Iron Fo

Hold 20th Ann

ACTIVITIES which are broadening the usefulness of the Gray Iron Founders' Society to its members and the industry are being steadily pursued, it was evidenced in the reports of its officers and committees presented at the society's 20th annual meeting at Haddon Hall, Atlantic City, Oct. 14-15.

Program of the meeting, which was attended by approximately 250, included, in addition to the business session, a symposium on foundry hygiene, a somewhat optimistic report on the pig iron supply situation and discussions on foundry personnel training and profit-sharing plans. At the first of two industry luncheons William B. Given Jr., president, American Brake Shoe Co., New York, spoke on the importance of long-range planning to attract the desired type of personnel in the foundry industry. Text of Mr. Given's paper was presented in THE FOUNDRY for November. Col. Harold G. Hoffman, former governor of New Jersey, addressed the Friday luncheon which concluded the two-day meeting.

Hermann P. Good, foundry superintendent, Textile Machine Works, Reading, Pa., was elected president of the society, succeeding Howard A. Stockwell, treasurer, Barbour Stockwell Co., Cambridge, Mass., who has served the last two years. Other officers elected are: Vice president, John E. McIntyre, vice president and general manager, Sibley Machine & Foundry Corp., South Bend, Ind.; secretary, Robert G. Schaefer, chairman and treasurer, Schaefer-Goodnow Foundries Inc., Pittsburgh; treasurer, Henry J. Trenkamp, president, Ohio Foundry Co., Cleveland.

New directors are: H. L. Edinger, president, Barnett Foundry & Machine Co., Irvington, N. J.; J. W. Simmons Jr., secretary-treasurer, Cox Foundry & Machine Co., Atlanta; E. B. Sherwin, president, Chicago Hardware Foundry Co., Chicago; C. F. Scherer, president, Davenport Machine & Foundry Co., Davenport, Iowa; H. D. Caylor, president, C. & G. Potts & Co., Indianapolis; A. E. Thomas, president, Thomas Foundries Inc., Birmingham, and S. D. Russell, president, Phoenix Iron Works, Oakland, California.

Incumbent directors retained on the board are: G. F. Hutchins II, treasurer, Standard Foundry Co., Worcester, Mass.; Hermann P. Good, Robert G. Schaefer, Henry J. Trenkamp and J. E. McIntyre.

A feature of the concluding luncheon program was the honoring of five individuals for outstanding service to the society and the gray iron foundry industry. As reported in THE FOUNDRY for November, p. 120, Arthur E. Hageboeck, executive vice president, Frank Foundries Corp., Moline, Ill., received the society's first gold medal award for his outstanding contributions to the general welfare of the industry and his brilliant accomplishment in establishing foundry cost groups throughout the country.

Other recipients of illuminated, commemorative scrolls were: Howard A. Stockwell, for outstanding service to the society which he served as president in 1947 and 1948; John M. Price, president, Ferro Machine & Foundry Co., Cleveland, for his exceptional leadership in connection with the formation and financing of the Foundry Educational Foundation; Arthur J. Tuscany, executive secretary, Foundry Equipment Manufacturers Association, for his years of service as the society's first general administrative officer, and Philip Frankel, secretary-treasurer, Superior Foundry Inc., Cleveland, for his wise leadership and sound counsel which, over a long period of years, has done much to benefit the gray iron foundry industry.

At the opening business session, presided over by Mr. Stockwell, Raymond L. Collier, executive vice president, reported that the plan to establish 40 local management groups embracing all gray iron foundries is well advanced. To date 30 such groups have been organized and are meeting regularly to deal with local and state problems. These 30 groups cover 86 per cent of all the gray iron foundries in the country

3

4

By WILLIAM G. GUDE
Managing Editor
THE FOUNDRY

...Founders
...Annual Meeting

and 91.5 per cent of the members of the society. It is hoped that the remaining ten groups can be organized within the next six months.

Mr. Collier also reported briefly on two other major objectives proposed by the society a year ago—a nation-wide advertising campaign and the launching of a long-range technical program. These subjects were discussed in greater detail later in reports by the technical director, Charles O. Burgess, and the Advertising Committee chairman, E. C. Hoenicke, general manager, Foundry Division, Eaton Mfg. Co., Detroit. It was indicated that the society's advertising campaign for the coming year will concentrate on selling the characteristics and important engineering properties of gray iron to engineers and designers throughout American industry.

Activities of the society in meeting problems created by shortages in pig (*Please turn to page* 226)

Fig. 1—Hermann P. Good, newly elected president of the Gray Iron Founders' Society. Fig. 2—John E. McIntyre, new vice president of the society (Below)—Awards for outstanding service to the society and the industry were presented by Howard A. Stockwell, society president, to: Fig. 3—Arthur E. Hageboeck, recipient of the society's first gold medal award. Fig. 4—Philip Frankel. Fig. 5—Howard A. Stockwell (right) shown receiving a scroll from H. L. Edinger, past president. Fig. 6—John M. Price. Not present but also an award recipient was Arthur J. Tuscany

Handling M

IN METAC

Equipment used for charging metals in the foundry melting department is discussed in this second of a series of articles dealing with materials movement in various foundry operations. The first article, describing materials handling in the foundry yard, was presented in the March issue

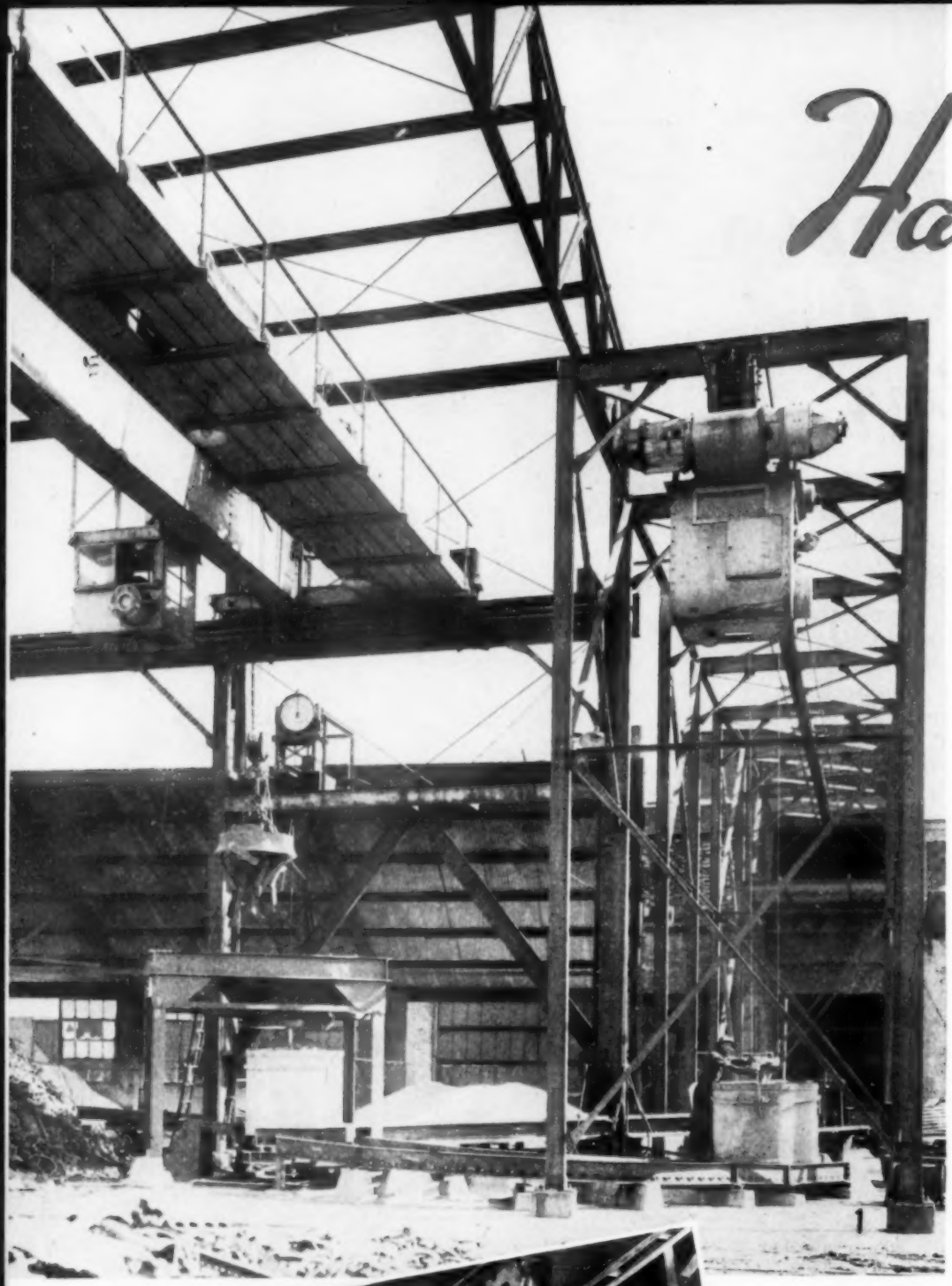


Fig. 1 — Monorail cupola charger picking up loaded bucket in make-up yard

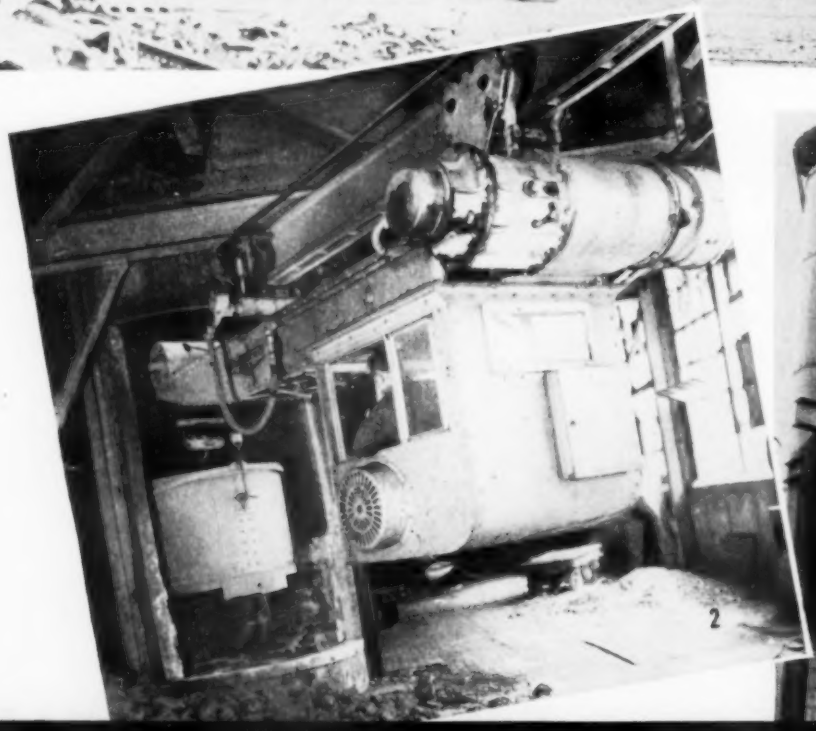


Fig. 2 — Double-leaf, drop-bottom bucket releasing charge into cupola

Fig. 3 — Switching arrangement permits this monorail charger to serve two cupolas

Fig. 4 — Automatic monorail cupola charger

Fig. 5 — Weigh hopper for making up coke and limestone charges

g Materials

A CHARGING

By ROBERT H. HERRMANN
Assistant Editor
THE FOUNDRY

SURVEYS made by manufacturers and users of equipment for moving materials indicate that the correct utilization of that equipment reduces measurably the cost of handling materials in process of manufacture. Such savings result primarily from decreasing the number of men engaged in activities which can be handled more easily and efficiently by machines.

Along with the savings in labor go savings in time required to perform any operation or series of operations. Both are expensive items in the budget and bulk large in the computation of castings prices. Shrinkage of these cost factors has a beneficial effect on the profit and loss statement. Not only can profits be increased, but the savings help to place the foundry in a much better competitive position by enabling it to offer a product at lower price—and frequently a product of improved quality.

The time factor is especially important when it has a direct effect on the efficient use of production equipment. Making full use of a skilled worker's ability, the capacity of any machine, and available plant space all are important considerations in reducing costs. And since smooth and continuous material flow is one of the major factors in efficient use of productive facilities, adequate equipment, correctly utilized, greatly simplifies the controlled movement of materials to meet production schedules.

Size of foundry often has been cited as a restricting factor in the use of materials handling equipment. Perhaps it might better be said that size of foundry indicates the type of handling equipment that can be utilized most efficiently. Rather than eliminate the use of equipment for certain operations, it might be better to select equipment that can be used for a number of different jobs, and the various operations scheduled so that any given piece of equipment is kept constantly busy, keeping itself on the move as well as the materials which it handles. Correct planning, good housekeeping and efficient use of equipment are as important in the smooth and continuous movement of materials as is the type and amount of materials handling equipment employed in any foundry.

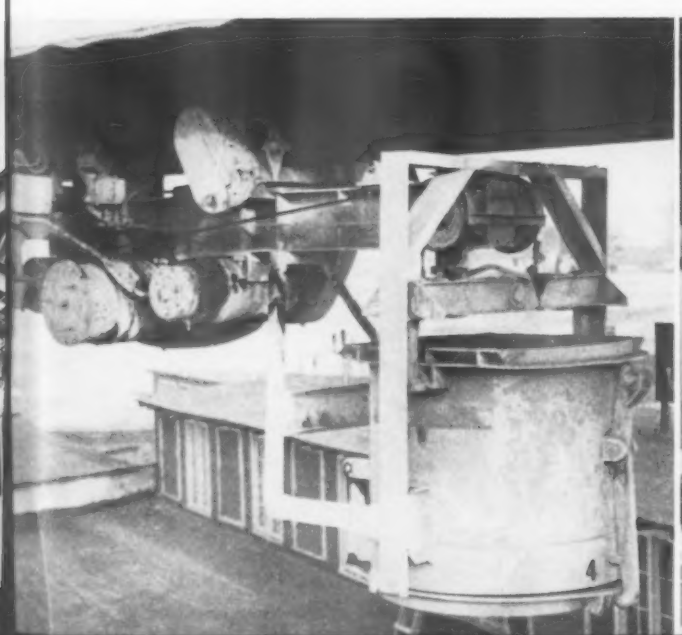
Furthermore, to produce the best results new equipment installations should be made only after careful consideration has been given to existing equipment, building design, space available and type of work being done. In other words the new installation should fit in with existing production facilities as well as with future plans.

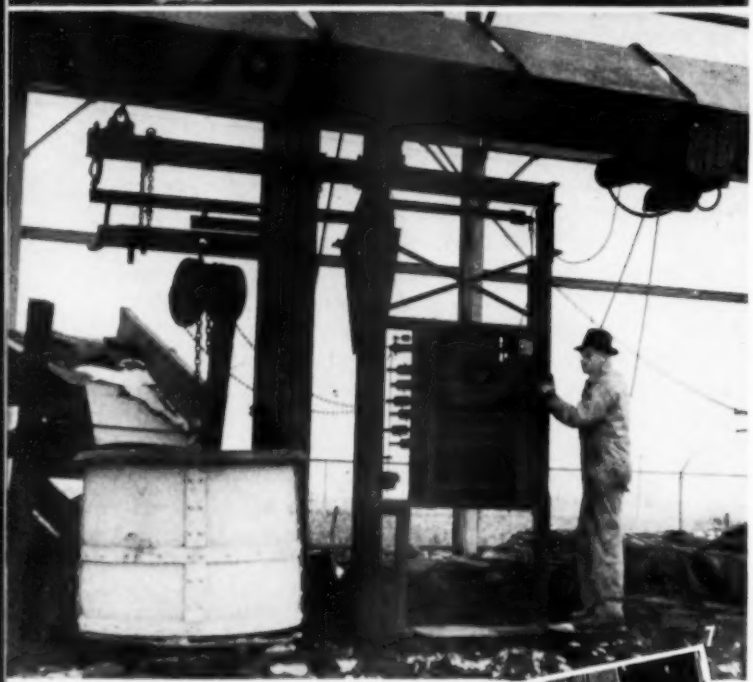
In the melting department where raw materials start the cycle of production which will ultimately furnish castings to the trade, many opportunities present themselves for the efficient use of proper equipment to help maintain a smooth flow of materials to, through and from the department.

In iron foundries mechanical charging is an important factor in economical operation of cupolas. Although reduction in labor is particularly noticeable on large installations running several hundred tons a day, worthwhile savings in man-hours per ton handled have been made in shops melting as low as 20 tons a day.

Mechanical charging also results in improved melting practice accompanied by economy of materials. Such advantages come primarily from the installation of equipment for carefully controlling the weight, handling and distribution of the charge, and placing of the charging door at a height which will permit optimum cupola operation and maximum fuel economy by obtaining full benefit of the fuel in preheating the metal in the charge, making it possible, in many cases, to reduce the fuel-to-metal ratio because of greater fuel efficiency.

In plants where hand charging is practiced, a charging floor representing a sizeable investment must be

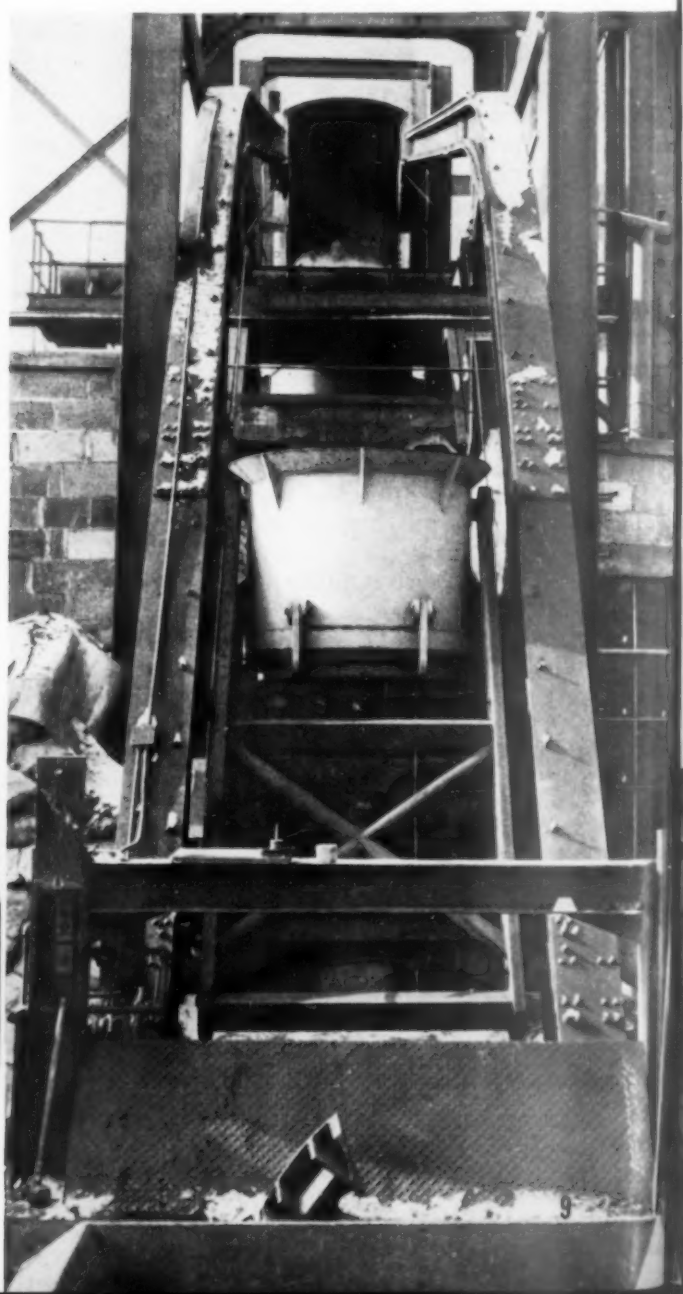




Handling Materials

furnished as a storage space for materials charged into the cupola. Height of this floor often is restricted by the roof of the foundry and the necessity for providing sufficient headroom for the men to work. This may necessitate placing the charging door at a level not conducive to optimum cupola operation. Furthermore, the cost of such a floor can be eliminated, particularly in new installations, and the money put into the acquisition of mechanical charging equipment which occupies little space and is simple, accurate and fast, requiring a minimum of attention by a supervisor once charging schedules have been set up.

One type of mechanical cupola charger is shown in Fig. 1. At right the 3-ton charger crane operating



on a monorail is preparing to pick up a loaded bucket for transportation to the cupola, and in Fig. 2 the bucket is shown discharging its 3000-lb charge into the cupola. As the charger backs up, carrying the bucket out of the cupola, it stops and lowers the bucket to the floor, where, with the help of rollers under its doors, the bucket is closed automatically.

With bottom doors closed it is lifted again and carried by the charger back along the monorail and lowered at one end of a U-shaped roller conveyor. The bucket is unhooked and carried down the gravity conveyor to the scale for filling. The charger backs up still farther to the other end of the U-shaped conveyor and picks up another loaded bucket and starts the cycle over again.

Three or four empty buckets waiting to be filled by the yard crane can be lined up along the conveyor leading to the scale. The crane shown here is an overhead traveling type of 5 tons capacity using a lifting magnet to pick up pig iron and scrap from the storage yard and deposit it in the buckets.

As the crane operator deposits the metals in the bucket he measures the weight of the various materials of which the charge is composed by watching the scale dial which is located on the crane runway, level with his eyes. After the charge is made up, the ground operator pulls an air lever, releasing the bucket from the scale and permitting it to travel down the gravity conveyor, coming to a stop underneath the monorail runway where it is picked up by the charger and carried to the cupolas.

Switches on the monorail permit the cupola charger to be switched to any one of a number of cupolas, and variable speed controls offer a wide range of speeds for all motions of the charger. Another feature of this charger equipped with the type of bucket illustrated is that the bucket can be lowered to the bottom of the cupola to empty the charge at the beginning of the day's operation.

A monorail cupola charging carrier serving two stacks through a switch is shown in Fig. 3 delivering a loaded cone-bottom bucket to one of the cupolas. All movement of the charger is controlled by the operator in the cab.

Another monorail type charger is shown in Fig. 4. This unit raises the loaded bucket, automatically moves forward, drops the charge into the cupola and then automatically returns the bucket to the pit where it is set on a transfer car to be moved under the weigh hopper, in which another charge has been prepared.

Fig. 1 shows only the metal elements of the charge being loaded. Coke and limestone can be shoveled by hand directly into the cupola from the charging floor or from storage into the bucket along with the metal charge and the combined charge emptied into the cupola. Equipment such as that illustrated in Fig. 5 is available for mechanically dumping into charging buckets the correct amount of coke and limestone.

The large hopper is divided into two sections—one containing coke and the other limestone—each section having a separate discharge chute. Air-operated arms open and close these chutes through the action of levers manipulated by the operator who measures the correct weight of each ingredient into the container on the scale car which travels along a track. The car, containing the correct weights of coke and limestone, can be rolled along the track to a point over a funnel which delivers into a charging bucket under the track. The container on the scale car has a dump bottom through which the coke and limestone charge is released into the charging bucket. A bucket conveyor used to convey coke or limestone into the hopper can be seen at the extreme right in Fig. 5.

Motor-driven transfer cars such as the one shown in Fig. 6 are designed to carry a cupola charging bucket along a track which runs under batch weigh hoppers where the correctly weighed charge of pig iron, scrap, coke and limestone is dumped into the buckets. The car carries the bucket with its complete charge along the track to a point where it is picked up by the cupola charger and carried to the charging door to be emptied into the cupola. The empty bucket is returned to the transfer car and the cycle is repeated. The usual practice is to use two buckets so that no time is lost in waiting; while one bucket is being loaded the other is being emptied into the cupola. The empty bucket on the right in the

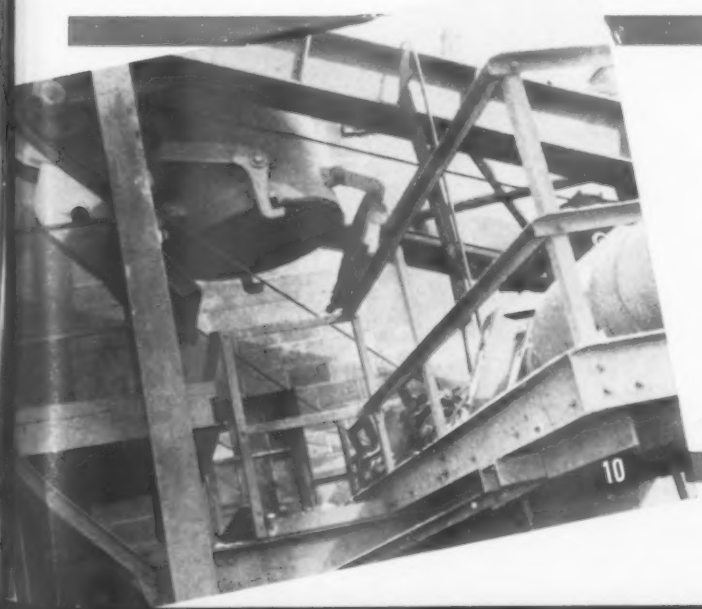


Fig. 6—Motor-driven transfer cars carrying charging buckets

Fig. 7—Monorail carrier travels through storage yard to gather charge

Fig. 8 — Hand-pushed carriers for gathering cupola charges

Fig. 9—Inclined skip hoist cupola charger

Fig. 10—Double-leaf, drop-bottom bucket used on the skip hoist charger shown in Fig. 9

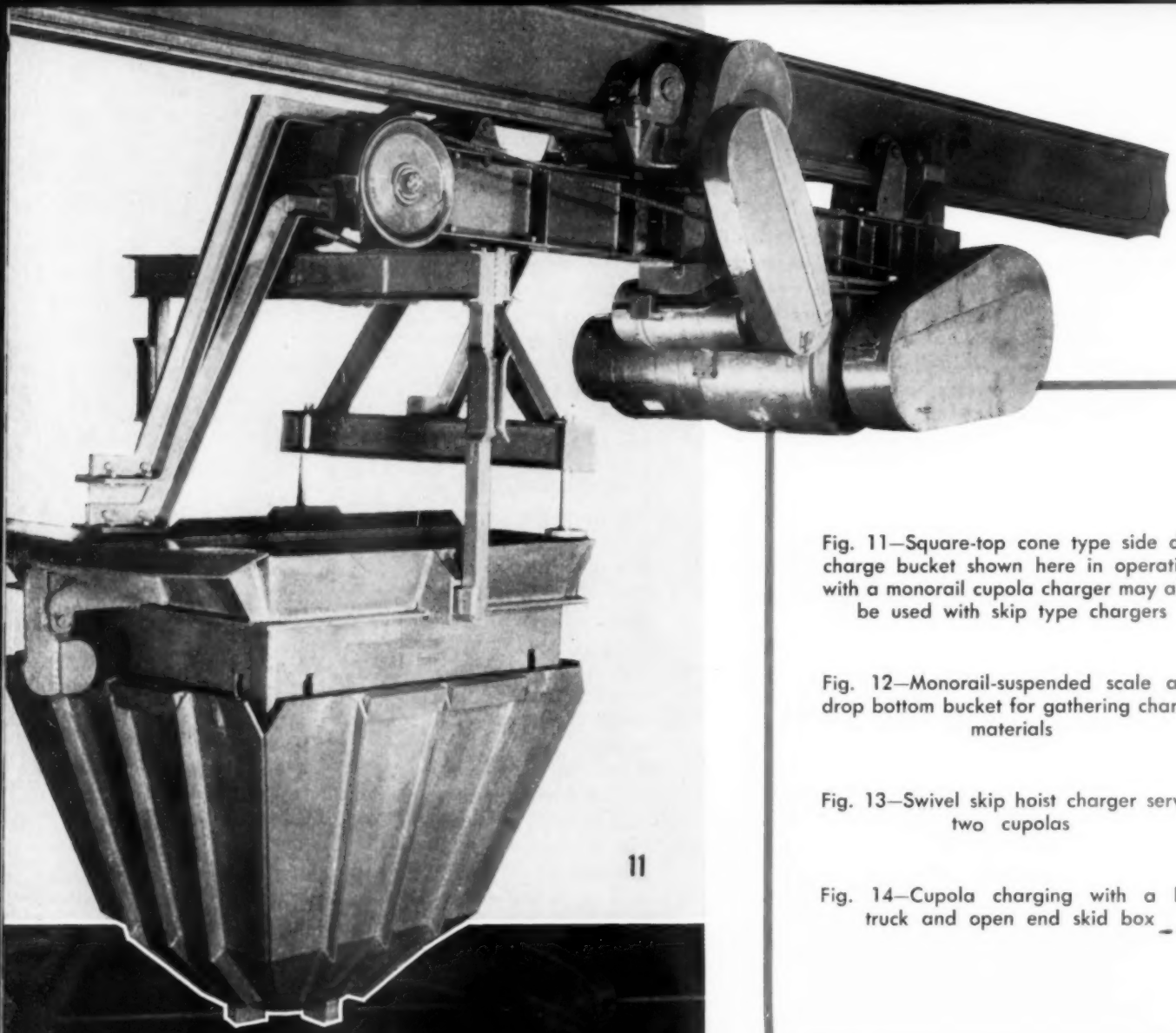
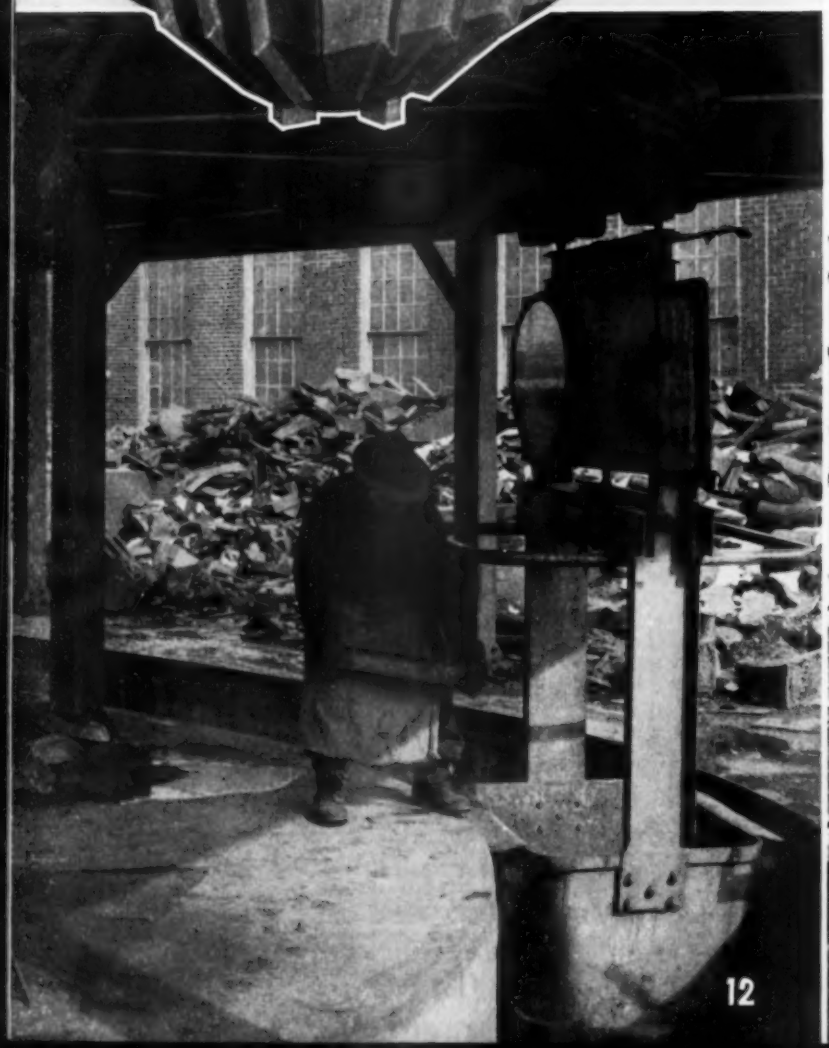


Fig. 11—Square-top cone type side discharge bucket shown here in operation with a monorail cupola charger may also be used with skip type chargers

Fig. 12—Monorail-suspended scale and drop bottom bucket for gathering charge materials

Fig. 13—Swivel skip hoist charger serves two cupolas

Fig. 14—Cupola charging with a lift truck and open end skid box



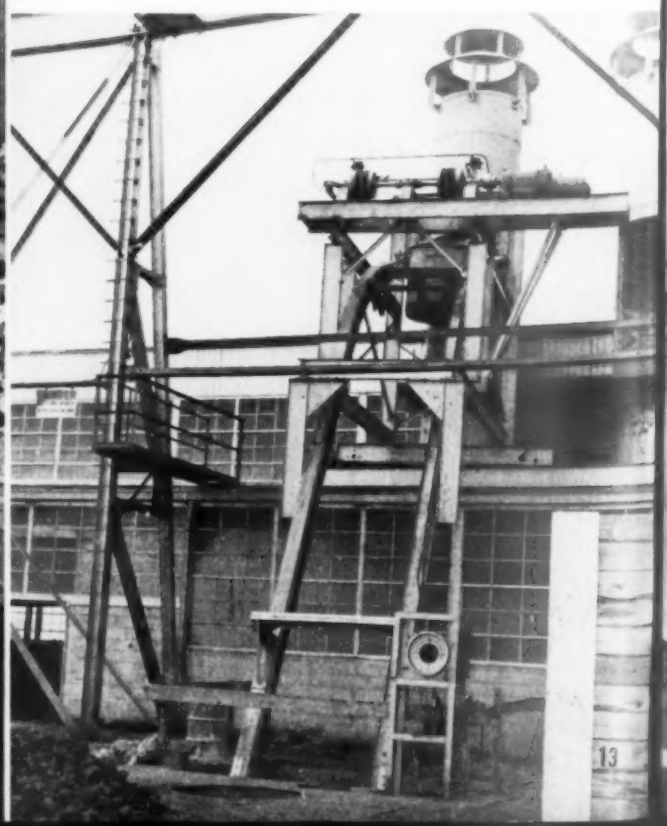


illustration has just been returned by the cupola charger and the car moved along the track to position correctly the loaded bucket. The transfer car operator can be seen hooking the loaded bucket to the hoisting cable on the cupola charger.

Another method of making up a cupola charge is shown in Fig. 7. The carrier illustrated is equipped with a scale and travels on a monorail through the storage yard gathering materials which make up the charge. The operator rides on a little platform from which he controls movement of the carrier and checks weights of the charge ingredients on the balance-type scale. Loaded buckets are deposited in a position convenient for picking up by the cupola charger, and empty buckets are picked up at the same point to begin their ride through the storage yard for charge make-up.

Hand-pushed charge carriers are shown in Fig. 8. These carriers are pushed along a monorail which runs through the storage section where the load of metal and coke is gathered in the carrier. Carrier in the foreground is resting on the scale section of the monorail track, and weighing equipment is visible at right in the photo. The empty carrier in left background is being pushed off the lift section to begin its charge gathering trip. When the loaded car has been weighed in correctly it will be pushed through a switch to the lift section for transfer to the cupola charging floor.

Fig. 9 shows an inclined skip hoist charging system. Skip hoist chargers are simplest of all mechanical systems and are particularly well suited to small and medium size cupolas—those with shell diameters of 36 to 60 in. The metal charge is made up by a one-leg, open-end gantry crane which also is used to unload cars of pig iron and scrap delivered to the foundry where this equipment is installed. Coke is dropped from railroad cars to an underground conveyor, transported to the storage yard, raised and piled. Because of the short distance between the coke pile and the make-up hopper, coke is easily wheeled by one man. Stone, piled next to the hopper, is forked by the charging foreman. Materials are loaded into the batch weigh hopper shown in the foreground of Fig. 9.

A scale in full view of the crane operator is plainly marked to indicate weights of the various materials that go into the charge. Pushbutton controls located on the column at charger operator's left operate the bucket hoisting mechanism.

The double-leaf, drop-bottom bucket starts from the loading position beneath the weigh hopper where it is loaded with the correctly weighed charge and is raised from under the hopper on the inclined tracks to the cupola. Raising, dumping and lowering are automatically controlled by one push on the control button. Raising is accomplished by an electrically driven drum which winds two cables running over pulleys inside the cupola and down each side of the runway to the bucket. The bucket, equipped with an automatic release, is pulled through the charging door into the cupola where the release hits an iron plate at the rear of the cupola and discharges the contents of the bucket. As the bucket descends from the cupola, the bottom leaves are open (Fig. 10). These leaves will be closed automatically as the bucket is pulled under the hopper.

Is at Ground Level

Vertical skip hoists are also available. They require a small amount of room and charges may be loaded into the bucket by hand or with materials handling equipment. Loading of the bucket is simplified because the top of the bucket in low position is at ground level, convenient for loading. This installation procedure usually is followed with skip hoist systems.

Skip hoist chargers often make use of an end-dump type bucket which resembles a large box-shaped scoop. Open end of the bucket is up as the bucket is hoisted. Contents are discharged simply by tipping the bucket, open end first, into the charging door.

Used in connection with an end-dump skip hoist charger is the monorail suspended scale and drop bottom bucket shown in Fig. 12. The completed charge is dumped through the drop bottom to the skip hoist bucket. With this combination of equipment, two men have been able to make up and charge 8 to 10 tons per hour.

A swivel skip hoist cupola charger for serving two cupolas is illustrated in Fig. 13. At the end of the day's heat, the charger is swiveled to the cold cupola by a hand ratchet. Swivel chargers of this type also can be equipped with electric motors so that they will index automatically and the cupolas can be charged simultaneously.

Various types of buckets, some of which are illustrated here, are employed with cupola charging equipment. Cone-bottom buckets such as those shown in Figs. 3, 6 and 7 are two- (*Please turn to page* 218)

By H. MORROGH
and J. W. GRANT
British Cast Iron Research Association

NODULAR CAST IRONS

Mechanical properties and commercial production of nodular cast irons are discussed further in this second and concluding article comprising a paper presented at the 45th Annual Conference of the Institute of British Foundrymen

ALL materials have some capacity for damping out vibrations. If a piece of hard steel be hung freely and struck by a blow it will ring and the sound will gradually die away, the vibrations being damped out. If, on the other hand, a similarly shaped piece of gray cast iron be struck, the note from it will die away very much more quickly. The high damping capacity of gray cast irons is attributed to the presence of flake graphite in the material. It may be anticipated, then, that a nodular cast iron would have a damping capacity lower than a flake graphite cast iron, but higher than that of a steel, since the plastic deformation of a nodular cast iron at low stresses is between the two. This has been verified by some tests carried out on a torsional damping machine. A rough indication is given by the sonority of a nodular iron casting compared with that of a similar flake graphite iron casting when the two are struck with a hammer.

The machine used for measuring the damping of flake and nodular cast irons was a Cambridge torsional damping capacity machine (Fig. 32) which tested a specimen of dimensions shown in Fig. 30. While the machine is hung freely, the inertia bar, which is attached to the center of the test piece, is twisted by means of a screw so that the specimen is strained radially about its axis. As the inertia bar is released the specimen is set into torsional vibration and a record of the damping is made by means of a stylus attached to the inertia bar which lightly scratches a line on a slowly-rotating celluloid disc. Fig. 33 shows magnified damping records of a steel, a nodular iron and a flake graphite iron obtained using this machine. The ability of the nodular iron to damp out its vibrations is obviously between that of a flake graphite cast iron and a steel.

This torsional damping capacity machine has many sources of error, but although little importance can be attached to the absolute values for damping, the values obtained do appear to give a useful comparison of different materials.

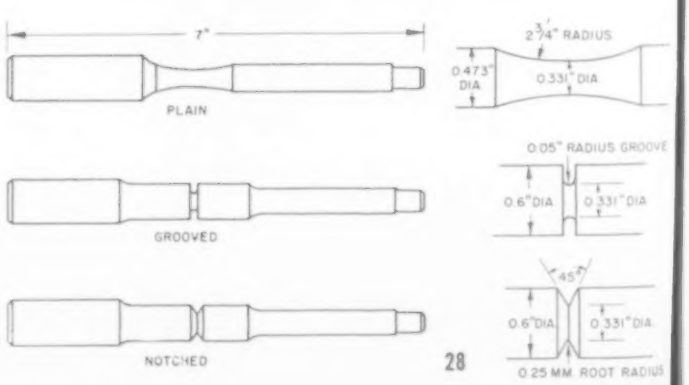
A damping test was made on the 1.2-in. diam bar V.835 and the 0.875-in. diam bars from the other nodular irons. The damping capacities for 1, 5 and 9 tons per sq in. are given in Table V (which appeared in the November issue) and graphs of damping capacity against stress are shown in Fig. 29, with a flake graphite iron and a steel included for comparison. This flake graphite iron, cast as 1.2-in. bars, had the following composition and mechanical properties:

Composition—Total C 3.13 per cent, Si 2.31 per cent, Mn 0.69 per cent, S 0.141 per cent, P 0.67 per cent. Properties—Transverse rupture stress 29.7 tons per sq in., deflection 0.20 in., tensile strength 18.3 tons per sq in., brinell hardness 244, modulus of elasticity (transverse) 17.6×10^6 psi, modulus of elasticity (tensile) 19.4×10^6 psi.

The damping capacity of many different types of flake-graphite irons have been studied, using this machine, and the values obtained have all been of the same order as those quoted here for a flake-graphite iron. No values have been obtained for flake-graphite irons which even approach the low values recorded for nodular irons.

Of the nodular irons, those with quasi-flake graphite, V.835 and V.980, which structurally most closely

Fig. 28—Form and dimensions of fatigue test pieces



resemble normal flake graphite irons, have the highest damping capacity and the iron with well developed nodules and a pearlitic matrix, W.30 has the lowest.

Fatigue—Fatigue tests were carried out on 0.875-in. diam bars from nodular irons V.980, V.895 and W.3 (see Table III presented in the November issue) and also on two other nodular irons, NOD.67 and W.7, single- and double-treated respectively, and on a flake-graphite acicular iron V.636. A Wohler-type cantilever machine rotating a 0.331-in. diam specimen (Fig. 28) at 3000 rpm was used, a test being terminated after 20 million reversals of stress if failure had not occurred. The chemical compositions of NOD.67, W.7 and V.636 are given in Table VI and the fatigue results on the five nodular irons and the flake graphite acicular iron in Table VII, both of which appeared previously. The fatigue curves obtained on a single- and a double-treated nodular iron, NOD.67 and W.3 respectively, are shown in Fig. 31.

Fatigue strengths of 12 and 15 tons per sq in. were obtained for single-treated, and 16 to 18.5 tons per sq in. for double-treated nodular iron giving endurance ratios of 0.46 to 0.59. These are high compared with values of 0.34 and 0.45 obtained on flake-graphite acicular- and pearlitic-irons of similar tensile strengths tested on the same machine. In Fig. 39 endurance ratios are plotted against tensile strength for the nodular irons and some flake-graphite cast irons. For each type of iron the highest endurance ratio is associated with the lowest tensile strength.

Notched and grooved fatigue tests were carried out on nodular iron NOD.67 and on flake-graphite iron V.636 for comparison. The fatigue specimens for the

Fig. 29—Variation of damping capacity with stress

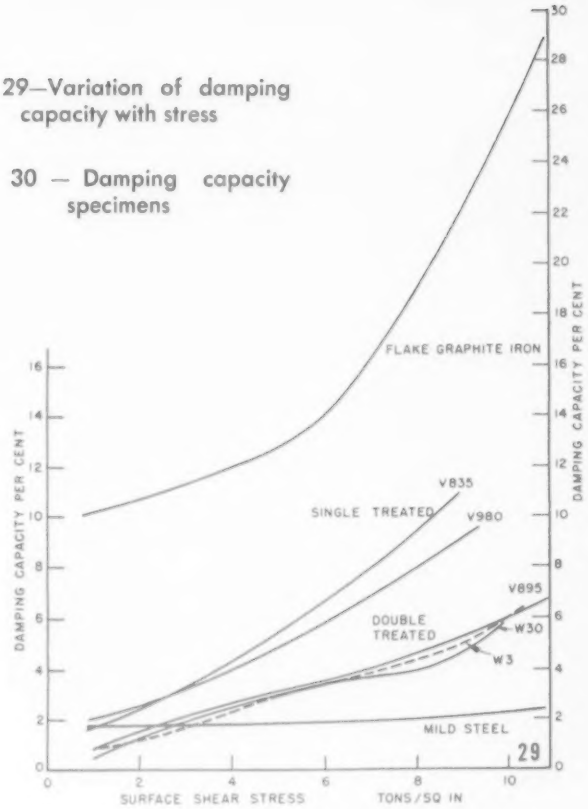


Fig. 30 — Damping capacity specimens

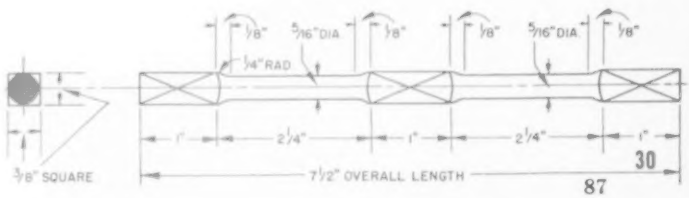


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Fig. 31—Fatigue curves for NOD. 67 and W.3

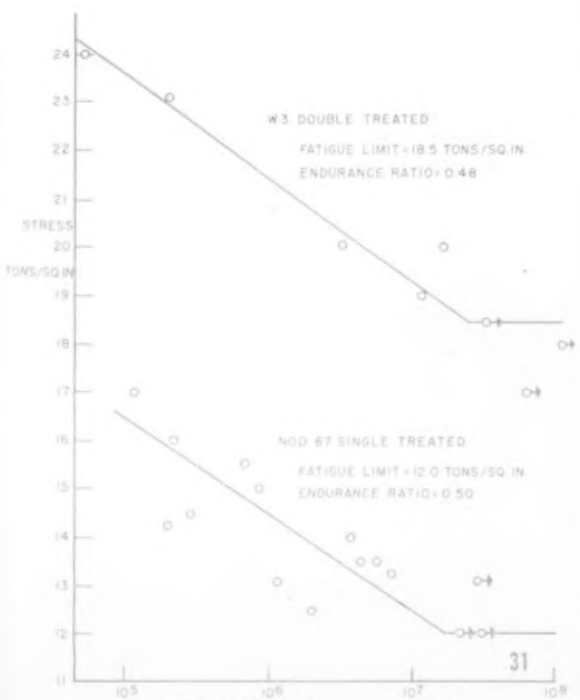
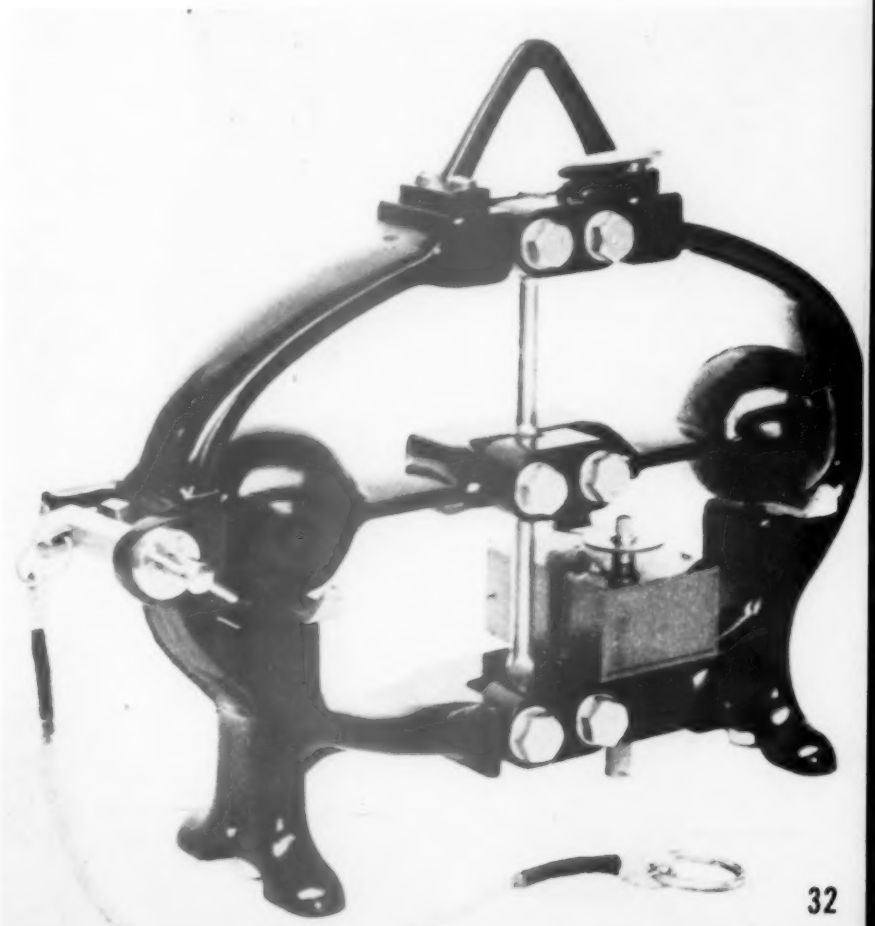
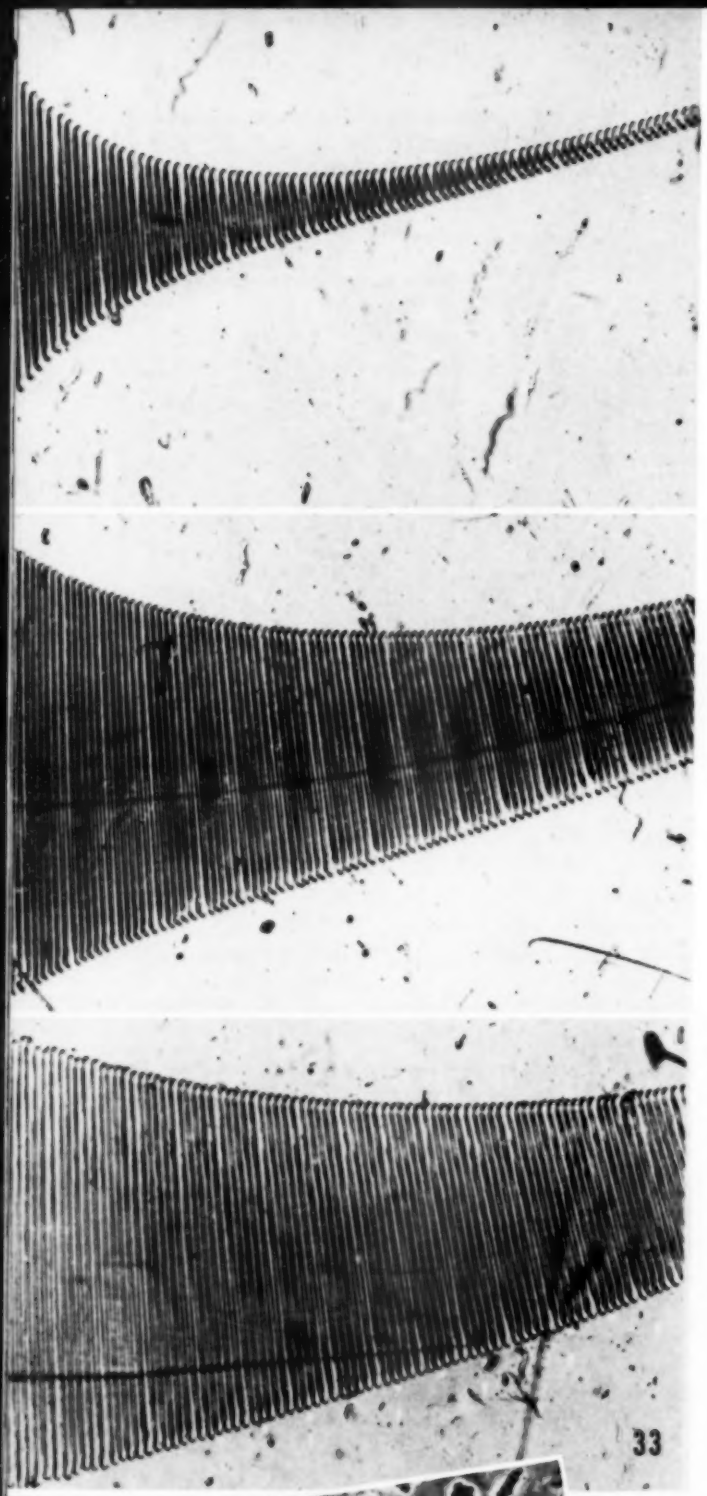

W3 DOUBLE TREATED
FATIGUE LIMIT = 18.5 TONS/SQ IN
ENDURANCE RATIO = 0.48
NOD 67 SINGLE TREATED
FATIGUE LIMIT = 12.0 TONS/SQ IN
ENDURANCE RATIO = 0.50
STRESS TONS/SQ IN
NUMBER OF REVERSALS LOG SCALE
31

Fig. 32—Cambridge torsional damping-capacity machine





tests were of the same overall dimensions, but instead of finishing with a large radius, 0.05-in. radius grooves or 45 deg. circumferential notches were machined with root diameters of 0.331 in., the same as the minimum diameter of the plain specimens with the large radius. Fig. 28 illustrates the plain, grooved and notched fatigue test pieces. The calculated stress at the root of the notch or groove was thus the same as the maximum stress in the plain specimen for a particular load hung from the free end. Notched and grooved tensile bars were also machined from each material and broken in direct tension. The fatigue and tensile results on the plain, grooved and notched bars are given in Table VIII (November issue), together with derived stress concentration factors, and the fatigue graphs are shown in Figs. 37 and 38 for materials NOD.67 and V.636 respectively.

Both the notch and the groove weaken the materials appreciably in fatigue, but this weakening is greatest in the nodular iron. In the notched specimens the fatigue limit drops from 12 to 7 tons per sq in. on the nodular material and from 11.5 to 8.5 tons per sq in. on the flake-graphite iron, giving dynamic stress-concentration factors of 1.72 and 1.35, respectively. The groove weakens both irons to a lesser extent than the notch, but again the weakening effect is greater on the nodular iron.

The notch and grooved tensiles, on the other hand, show a slight increase in strength on the nodular iron, but a considerable drop on the flake-graphite iron, particularly on the notched tensile test.

The data from these two materials are not sufficient to draw any definite conclusions, but they indicate that a nodular iron is not notch sensitive in a static test, but in a dynamic test it is more notch sensitive than a flake-graphite iron. A flake-graphite iron, on the other hand, is considerably notch sensitive in both

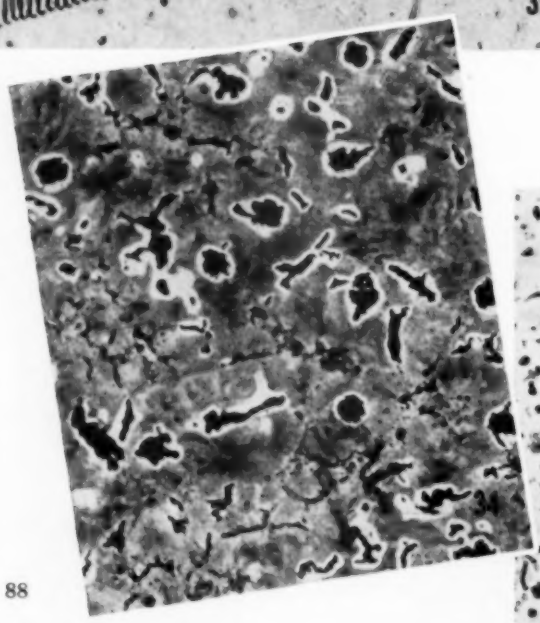
Fig. 33—Torsional damping-capacity records. Amplitude of vibration represents magnitude of torsional strain. Top-flake graphite iron; center-nodular graphite iron; bottom-mild steel

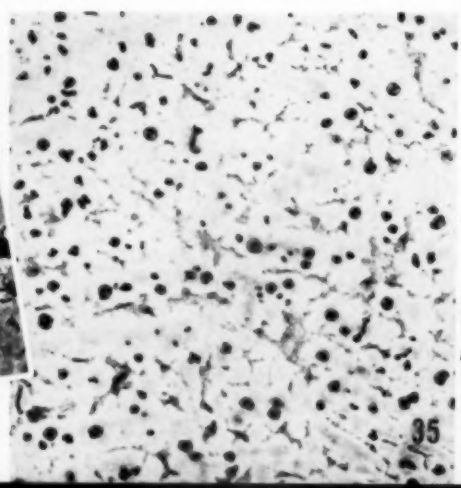
Fig. 34—General structure of nodulized hematite ring-specimen. Etched in picric acid. 60 X

Fig. 35—General structure of nodular Ni-resist ring-specimen. Etched in picric acid. 100 X

Fig. 36—General structure of sand-cast nodular Ni-resist. Etched in picric acid. 100 X

Fig. 37—Fatigue curves for plain, grooved and notched bars from NOD. 67





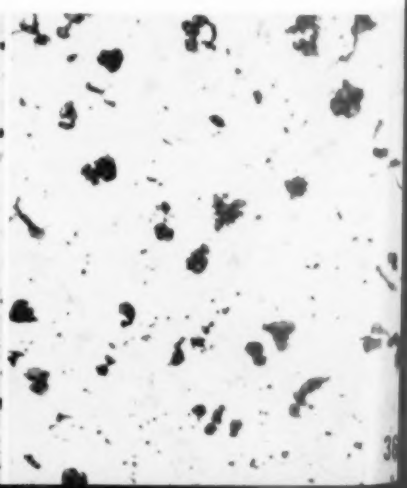


TABLE IX.—Tensile and Shear Test Results on Nodular Irons

No.	Cast Test Bar Diameter, In.	Treatment	TC Per cent	Si Per cent	Mn Per cent	S Per cent	P Per cent	Ce Per cent	Ultimate Shear Stress, tons/sq in.	Ultimate Tensile Stress, tons/sq in.
1	1.2	Single	3.72	3.13	0.74	0.007	0.038	0.040	22.2	24.6
2	1.2	Double	3.90	3.10	0.51	0.007	0.024	0.031	26.7	33.0
3	1.2	Single	3.86	2.62	0.54	0.015	0.030	0.034	21.0	23.9
4	1.2	Single	3.86	2.62	2.28	0.015	0.030	0.038	24.5	28.3
5	1.2	Double	3.67	2.67	0.86	0.005	0.051	0.040	26.4	26.0
6	1.2	Double	3.50	3.03	0.88	0.008	0.055	0.061	27.4	33.8

TABLE X.—Electrical Resistivity of a Number of Cast Irons

No.	Structure	TC Per cent	CC Per cent	GC Per cent	Si Per cent	Mn Per cent	S Per cent	P Per cent	Ce Per cent	Cu Per cent	Electrical resistivity microhms per cu cm
V.835	Quasi-flake, ferrite and pearlite	3.74	...	...	2.65	0.53	0.006	0.024	0.053	...	62.6
V.980	Quasi-flake, ferrite and pearlite	3.76	...	...	2.48	0.85	0.012	0.051	0.029	...	62.6
V.895	Nodular, ferrite and pearlite	3.55	...	...	3.01	0.89	0.004	0.044	0.053	...	66.9
W.3	Nodular, mainly pearlite	3.60	...	...	2.33	0.84	0.011	0.044	0.045	2.19	59.1
W.30	Nodular, mainly pearlite	3.68	...	...	2.34	0.77	0.009	0.035	0.054	1.49	60.6
W.161	Flake, mainly pearlite	3.81	...	...	2.29	0.51	0.032	0.032	....	...	101.7
V.93	Flake, mainly pearlite	2.98	0.74	2.24	2.13	0.70	0.050	0.037	....	...	66.2
V.171	Flake, mainly pearlite	3.16	0.52	2.64	2.46	0.54	0.007	0.036	....	...	75.3
Wrought iron	Ferrite	0.06	...	...	0.11	0.21	0.029	0.119	....	...	13.6
Mild steel	Ferrite	...	...	...	...	...	....	....	....	...	17.6

TABLE XI.—Thermal Expansion of Nodular Cast Iron

No.	Coefficient of Thermal Expansion per deg C $\times 10^{-6}$						
	20–100 ° C	20–200° C	20–300° C	20–400° C	20–500° C	20–600° C	20–700° C
V.835	10.5	11.3	11.8	12.3	12.6	12.8	13.4
V.980	10.3	11.4	12.1	12.6	13.0	13.2	13.7
V.895	10.6	11.3	12.0	12.5	12.8	13.2	13.8
W.3	10.5	11.4	12.0	12.6	13.1	13.5	14.1
W.30	10.3	11.4	12.1	12.6	13.0	13.3	13.9

TABLE XII.—Chemical Composition of Irons Used for Ring Tests

Material	TC Per cent	Si Per cent	Mn Per cent	S Per cent	P Per cent	Ce Per cent	Ni Per cent	Cr Per cent	Cu Per cent
Hematite, sand-spun, Nodular, No. 3	3.80	2.53	0.82	0.015	0.032	0.055	....	....	...
Ni-resist, chill-spun, Nodular, No. 13	3.01	2.86	0.85	0.012	0.029	0.060	13.55	1.88	5.67

a static and a dynamic test.

Shear—No direct shear tests were carried out on the five nodular irons used for the other mechanical tests reported here, but evidence from tests on other nodular irons has shown that ultimate shear stresses are usually lower than the corresponding ultimate tensile stresses. Tests were carried out in double shear on specimens 0.875 in. diameter, but unless the specimens were a very accurate fit in the holders they tended to distort and crack in the holders, hence giving false results.

Table IX gives the results of direct shear and tensile tests on a number of nodular cast irons.

An average coefficient of electrical resistivity for a flake-graphite cast iron is 60 to 80 microhms per cc, as compared, for instance, with a value of 14 for wrought iron and 17.6 for a mild steel. The difference is probably due to the presence of the graphite. Broadly speaking, in flake-graphite cast irons the electrical resistivity decreases with a decrease in graphitic carbon content. The restivity is apparently affected, too, by the form in which the graphite exists. The electrical resistivities obtained on the five nodular irons were given in Table V, and also in Table X, together with typical values (*Please turn to page* 230)

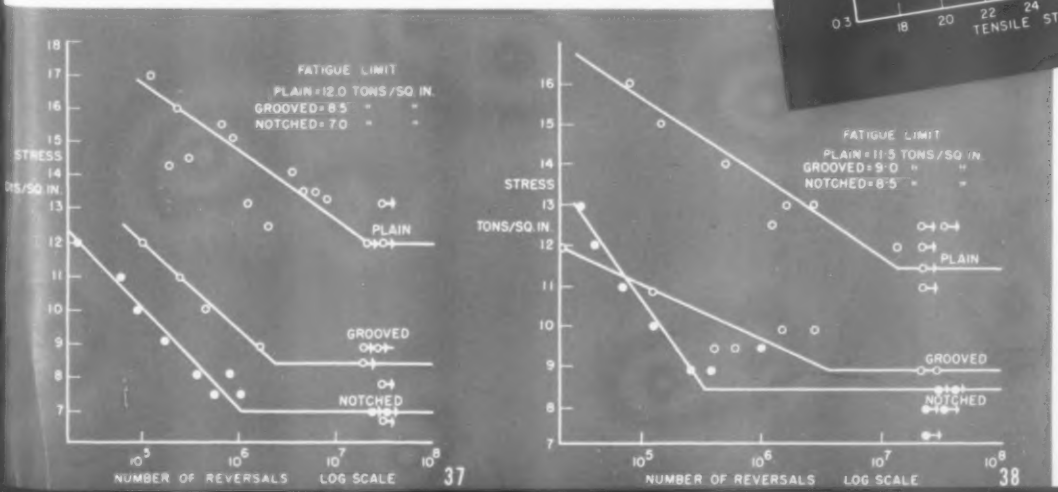


Fig. 38—Fatigue curves for plain, grooved and notched bars from V. 636

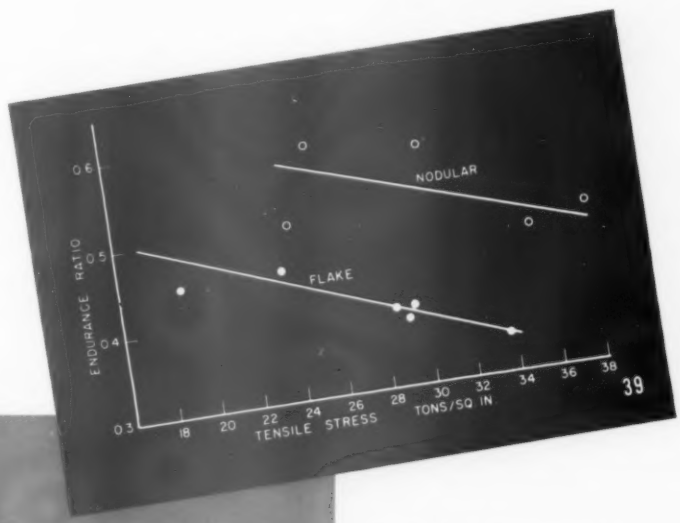


Fig. 39—Relation of endurance ratio to tensile stress

Non-Ferrous

MEMBERS of the Non-Ferrous Founders' Society, believing that the shortage of primary aluminum ingot and the high price of secondary aluminum are the biggest problems confronting the industry, have voted to bid on one of the two remaining aluminum reduction plants, one at Massena, N. Y., and the other at Riverbank, Calif. Formal action was taken at the annual meeting of the society held at the Warwick Hotel, Philadelphia, Oct. 22.

The entire afternoon program of the meeting was devoted to a discussion of the problem created by the aluminum supply situation. It was pointed out that manufacturers of aluminum ingot have found it more profitable to fabricate their own products than to sell to independent foundries for castings. No relief from the acute shortage is evident, and with the government's preparation for any national emergency, foundries must remain sound.

The plan for co-operative acquisition of one of the two remaining aluminum reduction plants being offered for sale by the government was proposed by James W. Wolfe, executive secretary of the society, who has been working on the project for some time. Following adoption of the resolution to form a co-operative organization for leasing or purchasing one of the plants, telegrams were sent to the War Assets Administration, Washington, and the Federal Works Agency, announcing the intention to offer bids. Louis Fischer, president, Fischer Casting Co., Plainfield, N. J., was named chairman of the committee formed to investigate and carry on negotiations with the proper government agencies.

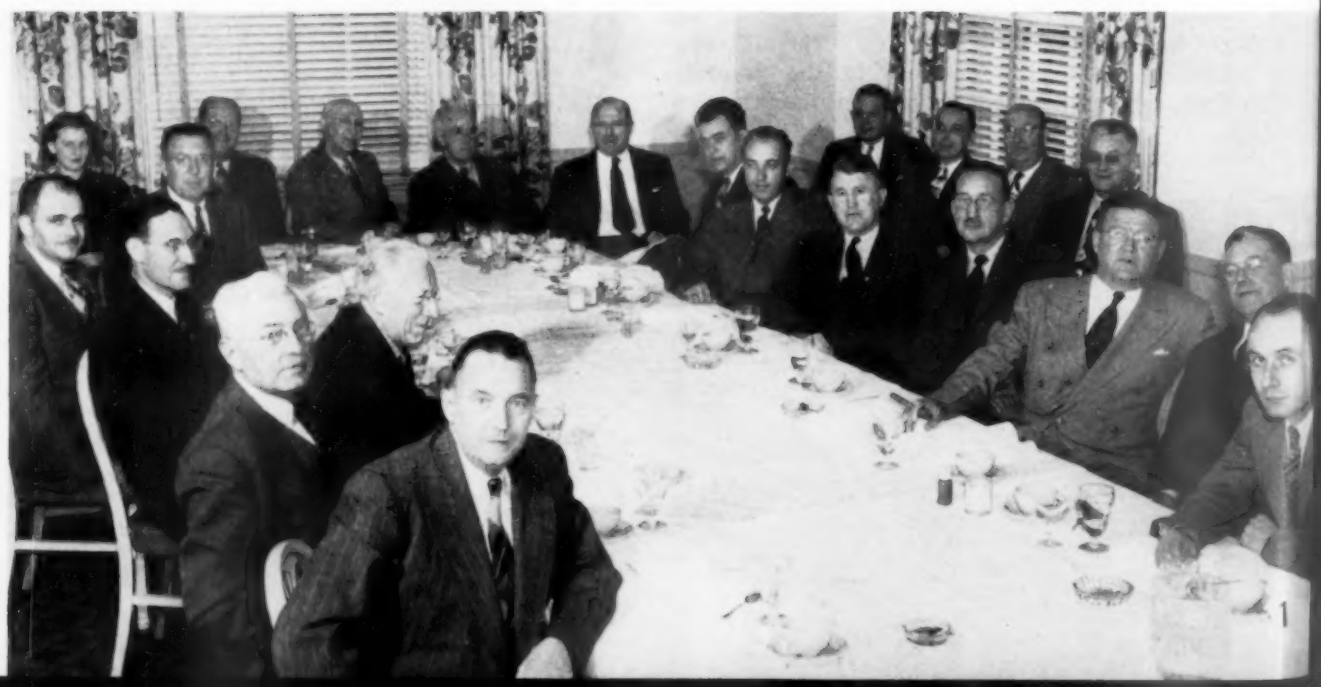
Fred Haack Jr., president, Capital Brass & Aluminum Foundry Co., Chicago, was elected president of the society; Walter M. Clark, president, D. W. Clark & Co., Boston, was named vice president, and J. D. Zaiser, president, Ampco Metal Inc., Milwaukee, was elected second vice president.

The following new directors were elected for a term of three years: E. T. Korten, Reliable Castings Co., Cincinnati; A. L. Goodreau, G-B Brass-Aluminum Foundry Inc., Los Angeles; Roy C. Wendelbo, DeSanno Foundry & Machine Co., Oakland, Calif.

FRED HAACK JR.
President

WALTER M. CLARK
Vice President

J. D. ZAISER
Second Vice President



By FRANK G. STEINEBACH
Editor
THE FOUNDRY

Founders' Society Seeks Aluminum Supply

The following directors were re-elected: Fred Haack Jr.; Walter M. Clark; L. H. Durdin, Dixie Bronze Works, Birmingham; and C. M. Anderson, Eagle Brass Foundry Co., Seattle.

The morning session of the annual meeting was devoted to reports of officers and committees, with William A. Gluntz, Gluntz Brass & Aluminum Foundry Co., Cleveland and president of the society, presiding. James W. Wolfe, secretary-treasurer of the society, reported on the various activities of the organization. He stated that the chapter movement continues to grow and that at present 13 chapter organizations afford an opportunity for local foundrymen to become acquainted and to discuss problems of both local and national character.

Mr. Wolfe indicated that the board of directors of the society will soon start studies and make recommendations for the standardization of both foundry supplies and equipment. He also indicated that a study of co-operative purchasing of supplies and equipment now is being considered. The Non-Ferrous Founders' Society is co-operating with the Foundry Educational Foundation and now has two trustees on the board of FEF. The society also is co-operating with National Castings Council.

According to Mr. Wolfe, one of the society's outstanding accomplishments is the publication of a manual for *Standard Accounting and Cost Procedure.* This work is being continued and the Cost Committee has prepared standard estimate forms which provides informative data for bidding.

President Gluntz paid special tribute to the work of the various committees of the society. George B. Hazen, Brass Foundry Co., Peoria, Ill., and chairman of the Labor Committee, reported on the surveys of wage rates which are distributed to members every six months by districts and the survey of fringe issues from labor contracts.

Edwin W. Horlebein, Gibson & Kirk Co., Baltimore, and chairman of the By-Laws Committee reported on recommended changes in the by-laws, most of which were of an editorial nature. The changes were adopted.

Fred Haack Jr., chairman of the Membership Committee, reported membership of the society now stands at 257. Nineteen new members have been added during the year. Mr. Haack discussed plans for furthering interest in the membership of the society.

Walter M. Clark, chairman of the Chapter Activities Committee, discussed the chapter work, reported that three more chapters are being considered, and emphasized the benefits to be gained through chapter activity. Several chapters have been busy with problems that affect the entire industry.

At the luncheon, Frank G. Steinebach, THE FOUNDRY, Cleveland, and (*Please turn to page* 186)

Fig. 1—Officers and directors of the Non-Ferrous Founders' Society at their recent annual meeting in Philadelphia

Fig. 2—Society officers, left to right, include: William A. Gluntz, retiring president; Ruth Anne Windsor, assistant secretary-treasurer, and James W. Wolfe, secretary-treasurer

PATTERNS and MOLDING for steelc

IN MAKING a mold by bedding-in and molder goes carefully over the drag after drawing the pattern and tests for soft-rammed places by feeling with his fingers. In spots where the sand is found to be soft, it is rammed down and extra sand is added until the mold seems to be firm, then smoothed off with the trowel. In regular green or dry sand practice, however, it is difficult to thus secure a mold as satisfactory as one in which the sand is all rammed vertically on the pattern. Cement-bonded sand, on the other hand, need not be rammed hard, in fact it is not possible to ram it to the same degree of firmness as is secured in green or dry sand work. The setting of the cement bond, however, gives the mold the necessary hardness and strength. For this reason a bedded-in drag made of cement-bonded sand, if reasonable care is taken to fix up soft-rammed spots, is quite as firm as a rolled-over mold. Foundries using cement-bonded sand, therefore, find bedding-in a satisfactory method of molding, and can often make a worth-while saving in pattern and molding costs by its use.

Certain patterns may be molded more advantageously by bedding-in than by the use of a rolled-over drag, even though they are not too large to be molded by the latter method. One typical instance of this practice is the hand molding of steam locomotive side frames. These long heavy castings are molded in flasks whose drags have one loose side which is removed after molding is complete. After closing, the molds are stood on edge for pouring as the heads are

Fig. 13—Pattern and follow-board ready for placement of drag flask

Fig. 14—Completed drag with pattern in place after rolling over and removal of follow-board

Fig. 15 — Appearance of casting after in-gates and sink-head are burned off

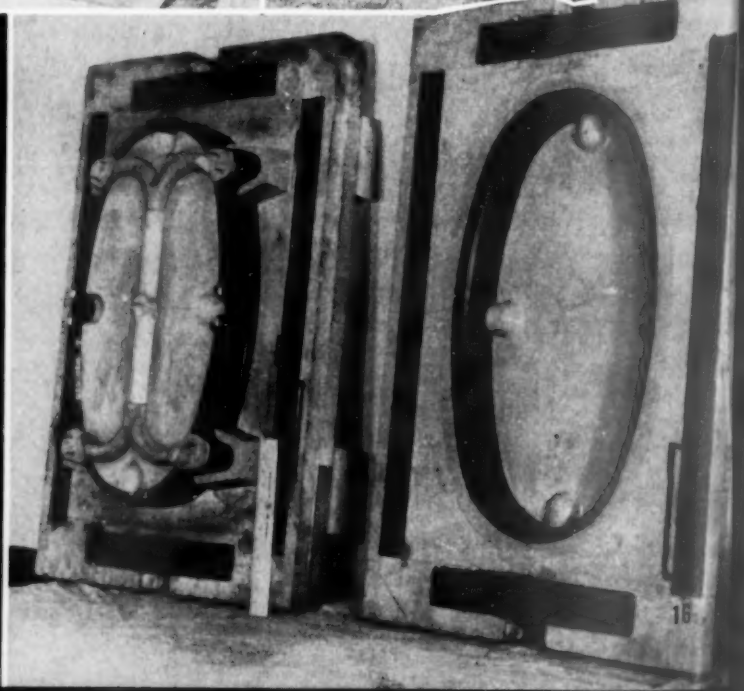


Fig. 16—Pattern split along suitable parting and mounted on separate boards

METHODS

elcastings

By JOHN HOWE HALL
Consultant
Swarthmore, Pa.

This is the second of five articles describing equipment and methods employed in the making of molds for steel castings. The first article was presented in the November issue

Fig. 17—Drag molds ready for setting of internal core

Fig. 18—Core is supported at three points by extensions called prints

Fig. 19 — Lowering large internal core into position

arranged to come through the open side of the mold with the down-gate also leading from this side. In making up the mold, the part corresponding to the drag is first rammed partly full of sand, which is leveled off by means of a sweep guided on the edge of the flask and dragged over the sand by two men.

The pattern is then set on the sand and pounded down till it is firmly seated, and extra sand is rammed into the pockets and alongside the pattern till it is level with the surface of the latter and the edge of the flask. The required sink heads are formed by integral parts of the pattern, and the gate made up of clay tile set end to end leads to the bottom member of the frame at one end. To protect the sand at this point from being washed away by the flowing metal, split bricks may be substituted for rammed sand, in a couple of feet of the mold. A further portion of the sand in the path of the flowing stream of metal is protected by being heavily nailed.

Wood or steel pins known as "soldiers" are driven into the sand of the drag at points close to the pattern, to help hold the sand up in the portions that have no other support when the mold is stood on edge.

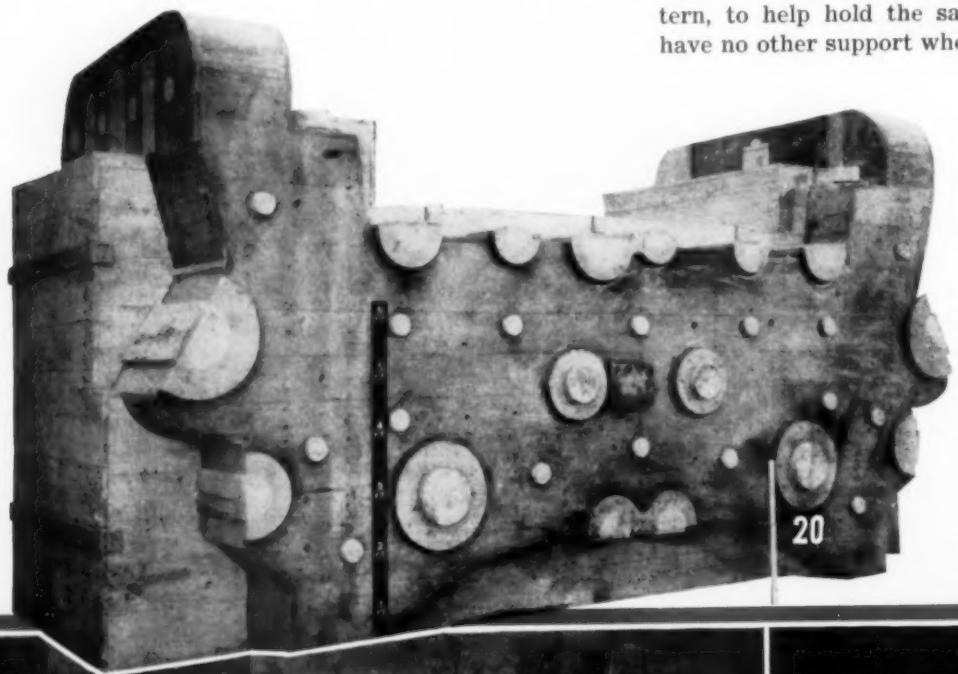


Fig. 20—Large pattern with prints for locating internal and external cores

Fig. 21—Two pieces of pattern in pit will form sides of drawbacks

Fig. 22—Arbor for main drawback

Fig. 23—Arbor shown in Fig. 22 in the pit ready for ramming up

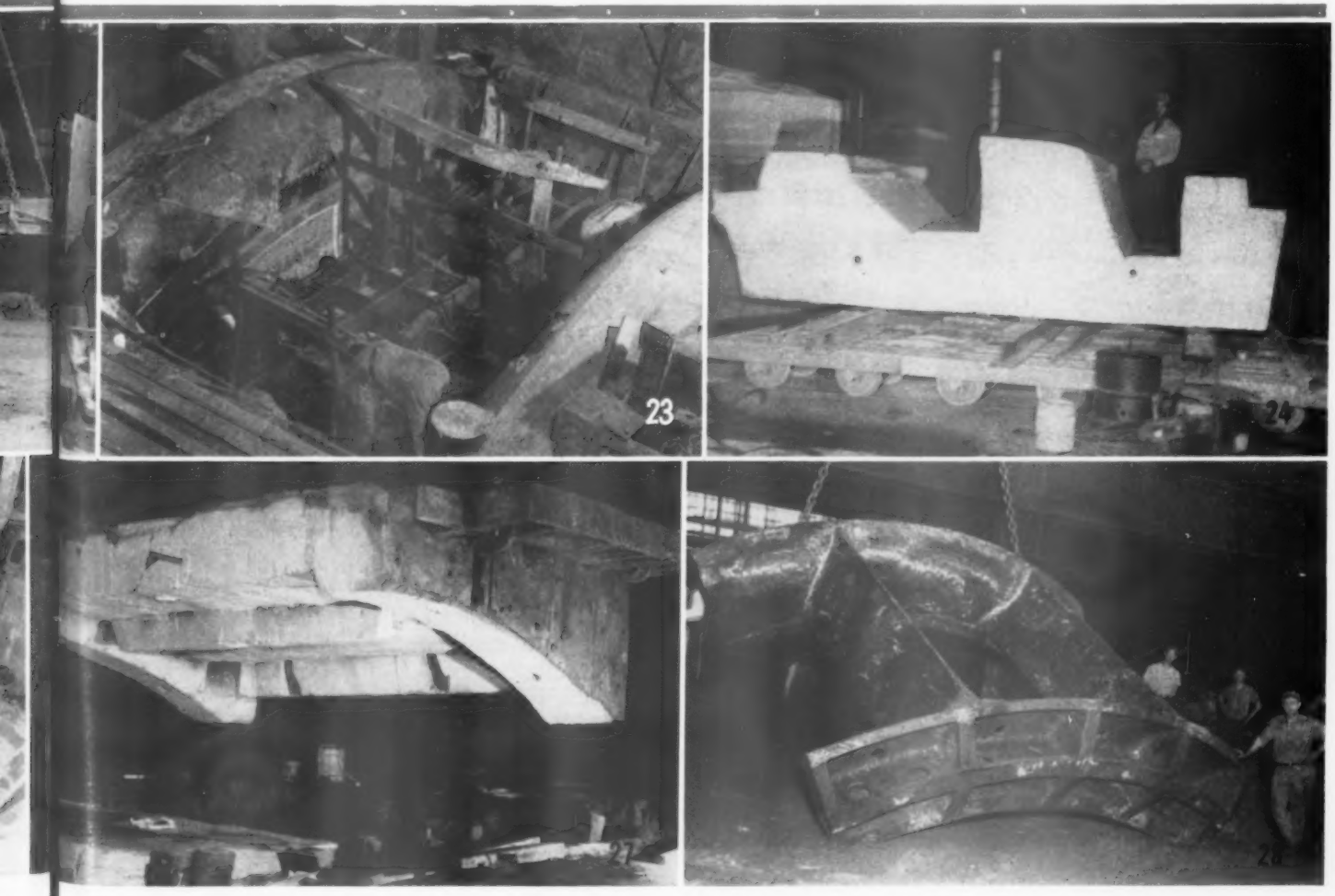
A cope is then set in place, rammed up and lifted off in the usual manner, and the pattern drawn from the drag. The cope, which is nearly flat, is heavily nailed to help hold the sand when the mold is poured. The loose side of the drag flask is then removed, and both halves of the mold are placed in the oven and dried. When closed and stood on edge, with the sink-heads and pouring gate uppermost, a pouring cup is set on top of the gate as for other molds of conventional type.

A "false cope" is made up in much the same way as a bedded-in drag, only in starting such a job the pattern is placed cope side down in a plain flask, provided with a bottom board, but usually without cross bars. The sand is rammed up to the proper level and smoothed off, just as in bedding in, either with a flat surface, or contoured so that there is no back draft. Parting sand is then sprinkled on, and a drag flask is set in position on the false cope flask and rammed up as it would be in using a split pattern. When the drag flask has been rammed full and leveled off, a bottom board or a grid is set on it, the two flasks and the boards are clamped together and rolled over. Then the false cope is lifted off, leaving the pattern in place in the sand of the drag. The surface of the sand in the drag obviously will follow the contour of that in the false cope, so that there is no back draft. Having served its purpose, the sand in the false cope is then knocked out. The sand in the drag is then smoothed down with the trowel, parting sand is sprinkled on it, a cope flask is set in position, and a regular cope, complete with down-gate and sink heads, is rammed up as in normal practice.

In order to reduce the weight to be lifted, it is occasionally desirable to lift and roll over only the drag and the pattern, instead of the drag, the pattern and the false cope. In that case, to prevent the sand from falling out, it is necessary to use a barred drag flask and set a number of gaggers in it, just as in making a cope. The pattern also must be held up in the drag by means of ring bolts and wedges, in the same way as the upper half of a heavy two-piece pattern is secured in the cope. This is by no means common practice, but is sometimes resorted to when the combined weight of drag, pattern and false cope is beyond the capacity of the available hoisting equipment, and a bedded-in job is not considered advisable.

The advantage of using a false cope instead of bedding the pattern in the drag is that in the latter method it is not always possible to pack the drag sand as tight as it should be, because of the difficulty of getting at all parts of the job to ram the sand, and the necessity of doing some (*Please turn to page* 209)

Fig. 24—Completed drawback on car of drying oven
Fig. 25—Arbor for secondary drawback
Fig. 26—After removing pattern, cores are put in place
Fig. 27—Cope being lowered into position
Fig. 28—Completed casting minus heads and gates



EFFECT OF GASES ON Tin Bronze

In this second and concluding article on the effect of gases on tin bronze castings the author recommends various procedures for the prevention of shrinkage porosity. The first article was presented in the November issue

By CLYDE L. FREAR
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OF the two monatomic gases under discussion, oxygen is less harmful in the metal than is hydrogen. Oxygen can be removed by suitable deoxidation of the melt, but there is no substance which will satisfactorily combine with the dissolved hydrogen and remove it from the solution, at least in amounts which are ordinarily encountered in bronze foundry operations. Furthermore we have an almost limitless supply of oxygen which is easily added simply by forcing more air through the burner. The answer to the problem then, would be to add oxygen to the atmosphere above the melt, which, by displacing the equilibrium toward the left, would remove some of the hydrogen from this atmosphere.

The recommendation to melt with an oxidizing flame is a sound one for the reason explained previously, and not because less water is formed when we use an oxidizing flame as many apparently believe. The theoretical equations given below show that the amount of water is exactly the same regardless of the type of flame used:

(4) $C_{15}H_{32} + 15\frac{1}{2}O_2 = 15\,CO + 16\,H_2O$ Reducing flame.

(5) $C_{15}H_{32} + 8\,O_2 = 15\,C + 16\,H_2O$ Smoky flame.

It is doubtful if these theoretical reactions can be obtained in any commercial melting equipment. Some carbon dioxide will probably be present in a reducing flame and both carbon monoxide and carbon dioxide will be formed in a smoky flame. Regardless of the relative amounts of carbon, carbon monoxide and carbon dioxide present in reactions (2), (3) and (4), the volume of water vapor will be exactly the same.

Because of the free carbon produced, the flame produced by reaction (5) would be exceptionally smoky, such as will be noted when turning on the oil in a hot oil-burning furnace without turning on the air at the same time. A reducing flame will be produced by using volumes of oxygen anywhere between the amounts shown by reactions (3) and (5), ranging from an exceptionally sooty flame, through a distinct yellow until reaction (3) is reached, when we will have a colorless or bluish flame. Usually, however, when melting copper-base alloys an oxidizing or neutral flame will have a greenish tinge because of the volatilized copper. This green tinge is not an absolute proof of an oxidizing flame, however, as a certain amount of reducing flame will also produce sufficient greenish color to counteract the yellow color of the flame.

The only certain test for oxidizing conditions would be by the use of a gas analysis apparatus. If the flame is oxidizing, only carbon dioxide and small quantities of oxygen—but no carbon monoxide—should be present in the products of combustion. The cold zinc test, while convenient, and useful in the absence of gas analyzing equipment, is not sufficiently accurate to distinguish between slightly oxidizing, neutral, and slightly reducing conditions.

The reactions explained previously have indicated the need for oxidizing conditions to prevent, insofar as possible, the decomposition of water vapor with the formation of hydrogen which would be absorbed by the bath of metal and result in porosity in the castings. Attention is invited to the fact that this oxidation only tends to prevent hydrogen entering the molten metal, but does not have much effect on removing hydrogen from metal which has already been gassed, such as may be obtained by using poor scrap from castings rejected for porosity, or insufficiently refined ingot or by the use of copper cathodes. Oxidizing conditions are a preventive rather than a cure. What then can we do to correct metal which has already been gassed?

Several methods are available each of which has its limits and must be used with certain precautions. First of all, let us consider the method which the steel melter uses to refine a bath of metal. When melting a bath of steel, a certain amount of iron ore, rust or mill scale is added with the charge. During the melting the oxygen of the iron oxide reacts with the carbon of the charge according to the reaction:

(6) $3\,C + Fe_2O_3 = 2\,Fe + 3\,CO$

The carbon monoxide being a gas, bubbles through the bath, each bubble picking up some dissolved hydrogen on the way and carrying it out of the molten metal. If there is enough carbon and oxide to produce a "boil" of sufficient length, all hydrogen will be removed. (*Please turn to page* 158)

MELTING STAINLESS STEEL IN AN Induction Furnace

By GORDON L. MEETER
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Alliance, O.

THERE are few written instructions to help a melter in determining alloying additions to be made to a heat of steel melted in an induction furnace. When beginning, most men in charge of melting have to make a guess at what the probable loss of alloys at meltdown will be and what will be the recovery of alloy additions made to bring the heat to the desired composition.

For example, an aircraft parts manufacturer decided to produce stainless steel castings from type 347 alloy melted in an induction furnace without any previous experience with that method. Base raw material selected was type 321 titanium stabilized stainless steel scrap, since it was available in quantity from other plant operations. Typical analysis of that material shows 0.10 per cent max C; 2.00 per cent max Mn; 1.00 per cent max Si; 0.04 per cent max P; 0.04 per cent max S; 17.00 to 19.00 per cent Cr; 8.00 to 11.00 per cent Ni, and 4 × C min Ti.

As might be expected, many difficulties were encountered and considerable time was spent in evolving a procedure whereby a consistent chemical analysis could be maintained in producing type 347 stainless steel. Wanting to be sure of the initial analysis of the steel 200-lb heats of type 321 scrap were melted in the induction furnace, poured into ingots and analyzed. After required additions to this analysis to produce type 347 metal were calculated, the type 321 ingots were melted. Then the additions were made, and when the metal reached the required temperature, the heat was poured.

After analyzing the first one hundred heats for titanium content, it was found that less than 0.10 per cent was retained, so this element was considered lost in melting and no further heats were analyzed for titanium. The analysis desired was as follows: C—max 0.20 per cent, Mn—max 2.00 per cent, P—max 0.030 per cent, S—max 0.030 per cent, Si—max 1.50 per cent, Cr—18.00 to 20.00 per cent, Ni—10.00 to 14.00 per cent, and Cb—min 10 × C, max 2.00 per cent.

As the weight of the additions was considerable, only enough ingot was charged to bring the melt to 100 lb when the additions were all in the bath. Since all steel heats seem to be improved by the action of oxygen during the melt, 0.23-lb of powdered hematite ore per 100 lb of metal was added with the charge of ingots.

The nickel addition, which was figured to 13.00 per cent from the ingot analysis, was also added to the furnace with the charge. No allowance was made for a loss of nickel since practically 100 per cent of this alloy is retained during melting.

When the ingots had all melted down, the first addition, ferromanganese of the lowest carbon grade, was made. Early heats showed that an addition of 0.48-lb of 80 per cent low-carbon ferromanganese gave a satisfactory manganese content in the metal. As soon as the ferromanganese was dissolved, the ferrosilicon addition was made (0.36-lb of 90 per cent grade).

When the ferrosilicon was dissolved, the low carbon (max 0.06 per cent C) ferrochromium was added. Chromium was difficult to calculate at first, because the higher the chromium in the bath the more chromium it is necessary to add for each per cent it is desired to retain.

An empirical formula was evolved which worked quite satisfactorily. The chromium content aimed at was 20.00 per cent. The analysis of the ingot was subtracted from 20.00 per cent. One and one-half times the difference was added to the heat if the chromium of the ingot was over 17.50 per cent and one and one-quarter times the difference was added to the heat if the chromium was under 17.50 per cent. This was somewhat confusing, because more ferrochromium was added to a 17.60 per cent Cr ingot heat than was added to a 17.45 per cent Cr ingot heat. However, the formula worked and the desired chromium content was never missed in 800 heats. The analyses of the heats were closely watched so that the formula could be varied if necessary.

The formula would work as follows when figuring the chromium addition for a 100-lb heat. 20.00 per cent Cr (desired) − 17.60 per cent Cr (in ingots) = 2.40 per cent. 2.40 per cent × 1½ = 3.60 per cent or 3.60 lb for a 100 lb heat.

$$\frac{3.60}{0.64\ (\text{Cr in FeCr})} = 5.62 \text{ lb FeCr to be added}$$

When the ferrochromium was dissolved, which took some time since its weight was about one-twentieth of the charge, 0.13-lb of aluminum was added to the melt.

As soon as the aluminum dissolved, the ferrocolumbium was added to the bath. Though the carbon in the induction heats rarely approached 0.11 per cent, it was decided to (*Please turn to page* 249)

Questions AND Answers

Oil Is Not Used as Cupola Fuel

Q.—We shall appreciate any available information on the general subject of substituting oil for coke, coal or charcoal in the cupola. In this country oil is cheap and plentiful while solid fuel of any kind is scarce and very expensive.

A.—As early as 1909 experimental work was done in developing an oil-fired cupola, and while some use was made of that principle in 1918, it never did become a commercial unit. The oil-burning cupolas did not eliminate coke entirely between the iron charges, but did reduce it to a ratio of 12 to 1; the additional heat being supplied by oil burners fired through the tuyeres.

However, since oil is cheap and plentiful, it appears to us that your wisest course would be to employ a reverberatory type furnace such as used for malleable iron melting, or a smaller unit now on the market which it is claimed will melt either iron or nonferrous alloys.

Wants Good Machinable Castings

Q.—We have been unable to get any pig iron and at times run into difficulties with our castings getting too hard, shrinking too much, etc. Could you give us any information on how to get good machinable castings without using pig iron?

A.—Without knowledge of the section thickness and size of the castings you are making and the raw materials forming the iron charge, we can only offer some suggestions on how to obtain machinable castings. Evidently your silicon runs lower than desirable at times, causing the hard structure. Hence, additional silicon in the form of ferrosilicon, silvery pig iron (around 10 per cent silicon), ferrosilicon briquets, or exothermic silicon compound must be added to bring that element to the desired range. Possibly additions of nickel or copper might turn the trick.

Presumably you do not have a laboratory to perform chemical analysis, and depend on your experience to provide suitable mixtures. Hence, you calculate the ingoing silicon in the charge, estimate the loss, and assume the final silicon content. For calculation purposes the following silicon contents of scrap should be used: No. 1 machinery and No. 1 cast—2.10 per cent; automotive cast—2.25 per cent; agricultural scrap—2.25 per cent; No. 1 railroad—2.15 per cent; No. 2 railroad—1.90 per cent; No. 3 railroad—1.25 per cent; radiator—2.30 per cent; all malleable—0.95 per cent, and steel scrap—0.25 per cent.

Loss of silicon during melting usually is figured at 10 per cent, but it will have to be determined for your particular operation. For the purpose of illustration it will be assumed that you are making castings which require a silicon content of 2.40 per cent, use a 1000-lb charge, and are going to use 30 per cent return or home scrap containing 2.40 per cent Si, 35 per cent agricultural scrap with 2.25 per cent Si, and 35 per cent No. 1 cast with 2.10 per cent Si. Total ingoing Si then shows an average of 2.24 per cent and the loss of say 0.23 per cent Si leaves the iron over the spout with a silicon content of say 2.00 per cent.

Since the desired content is 2.40 per cent you will have to provide 0.40 per cent per lb or 4 lb Si per 1000-lb charge. Since the loss during melting also will be assumed to be 10 per cent, you will have to add 4.4 lb of Si. That can be accomplished by adding 44 lb silvery pig (10 per cent Si), or 8.8 lb ferrosilicon (50 per cent Si), or five small silicon briquets (1 lb Si).

Gives Cupola Construction Data

Q.—We are building a cupola with an inside shell diam of 32 in. which will be lined to 23 in. Can you tell us how many tuyeres we should use, and what size they should be? How large should the windbox be, and how many cfm of air should we use and at what pressure? How far above the cupola bottom should the taphole and slaghole be? We plan to make gray iron machine castings from the iron melted in this cupola, and to accomplish this the iron must be correctly melted.

A.—Some of the information you request is given in the *Cupola Handbook*, published by the American Foundrymen's Society. It mentions that a 23-in. cupola should have a tuyere area of 85 sq in., but the number of tuyeres is not specified. In this size cupola you could use four or six. Four tuyeres 3½ x 6 in. or six tuyeres 3½ x 4 in. would give the same area of 84 sq in. and be satisfactory. Usual rating of such a cupola is 2 tons per hr, and the handbook recommends a bed from 36 to 42 in. in height, coke splits of 35 lb, and an iron-to-coke ratio based on the coke split; that is, with an 8-to-1 ratio the iron charge would be 280 lb, and with a 10-to-1 ratio, the iron would be 350 lb.

Air volume recommended is 940 cfm at 12 oz supplied by a blower rated at 1040 cfm at 16 oz. Other information presented is that the windbox or belt ranges from 10 to 14 in. wide and 3 to 4 ft high, and in your case we believe that the smaller figures will be applicable. Sand bottom will be about 4 in. thick, and the taphole will be that distance above the bottom plate. You do not state how much iron you want to tap out at any given time; that is, whether you will want to pour a casting weighing say 1000 or 1500 lb or whether the largest will weigh only a few hundred pounds, and that information will be necessary to determine the height of the slag hole and tuyeres.

Ordinarily the well of the cupola is designed to hold

at least two molten iron charges which in this particular cupola would be 600 lb minimum. According to our calculations each inch in height of a 23-in. cupola will give a volume of 0.24-cu ft of which 60 per cent is occupied by coke. Hence, it can hold only 43.2 lb of iron, and to carry 600 lb of iron the well would have to be about 14 in. high; to hold 1000 lb the well would have to be slightly over 23 in. high.

To these figures you will have to add the thickness of the sand bottom, or 4 in., which would mean that the slaghole should be 18 in. or 27 in. above the bottom plate of the cupola. As the slaghole is from 4 to 6 in. below the tuyeres, the latter will be located 22 to 24 in. or 31 to 33 in. above the bottom plate.

Matchplate Thinner in Center

Q.—We are making sand-cast aluminum matchplates using a local sand which is considered a good molding sand, and is quite fine. However, we are having trouble with the plate turning out thinner in the central part near the pattern parting line. Hence, when the pattern is in production, the mold crushes slightly at the parting line.

A.—While we cannot supply a definite answer on why your matchplates are thinner near the center than at the edges, several possibilities come to mind. One is that the flasks do not contain sufficient bars to hold the sand from sagging slightly in the central area. The sand must have some support from bars or bars and gaggers if a comparatively large area is involved. Possibly if bars are present, the sand is not tucked firmly around them to give the necessary support.

Another cause, though not too probable is the method of ramming whereby the central section is rammed sufficiently but the outer area is not, permitting swelling to occur through the pressure of the metal. Others in the same category include not striking off level, leaving the mold high in the center, and use of hold-down weights which bear mainly on the center part of the mold.

Permanent Mold Not Successful

Q.—We operate a foundry in Australia, and are trying to establish a section for production of brass castings by the permanent mold process. We are trying to make a water meter body, and have not had too much success. Sand cores are employed and the alloy is 67 per cent Cu, 30 per cent Zn and 3 per cent Al. Is that suitable or do you suggest another? We have found that drop runners or gates are not successful; a runner at the bottom letting the metal rise seems more satisfactory. A coating for the mold or die is a major concern. We have tried thin plumbago wash sprayed on as well as crude tar thinned with kerosene, but after a time they flake off. Temperature of the die seems to play a big part in the success or failure, and we have found that as the temperature rises the product deteriorates. Have you any information that you can give us in this field?

A.—In the permanent mold process, as with any other molding procedure, consideration must be given to obtaining directional or progressive solidification to obtain sound castings, but, due to mechanical and other considerations, that condition can only be obtained indirectly. In other words, it hardly ever is possible to design a mold which will cause the metal to freeze first at points most remote from, and then gradually to, the gate. However, by the application of external cooling, heating, or insulating coatings, or use of coatings on the internal face of the mold, it is possible to approach directional solidification.

The coating on the mold face is important, since it performs three functions—it protects the surface from the action of molten metal, permits easy removal of the casting, and controls the freezing rate of the metal. Available mold coatings incorporate a refractory material such as French chalk, china clay, whiting, talc, asbestos, mica, graphite, rouge, fireclay—used alone or in combination. The material is suspended in water with addition of a small amount of sodium silicate or water glass. Coating consistency should be thin and preferably applied with a spray gun. Mold should be heated to a point that the casting dries on application, and a number of thin coats applied rather than one or two thick coats. Around the gates and other areas where slow cooling is desired, the number of coats is at the maximum, and where rapid cooling is needed only one or two coats are applied. Where the coating is applied too heavily, it may be removed by rubbing with steel wool.

As you mention, gating from the bottom gives most satisfactory results, although in some cases top gating is quite successful. However, with the particular alloy you are using, it is essential that the metal enter the mold with minimum turbulence, since the aluminum oxide skin must not be broken or inclusions will result. Unless there is some specific reason for using the aluminum-bearing alloy, we believe that you will obtain much better results with the 85-5-5-5 alloy, since it is much easier to handle.

Operating temperature of the mold should be con-

GANGWAY!

By J. A. PATTERSON

"I haven't broken anything, stupid—I just said that when they made that baby, they musta broke th' mold!"

Questions AND Answers

sidered from the viewpoints of mold life and cycle of operation. The higher the temperature, the shorter the mold life, and also the longer it takes the casting to solidify. Hence, it is wise to keep the mold at the lowest possible temperature at which castings free from cold shuts or seams can be consistently obtained. We would judge that an operating temperature of 500 to 600°F should be satisfactory, but the most suitable range will have to be determined experimentally.

Sand Carried by Metal Stream

Q.—In the brass combination faucet body we are sending, you will note a number of small pits on the polished surface. This type of defect is causing considerable loss in our polishing and plating operations. Can you tell us the cause and remedy?

A.—After a casting has received polishing and buffing operations, it is quite difficult to ascertain the cause of the pitting or pinhole defect since the holes become filled with grease and buffing compound. However, the tearing effect observed around several of the holes gave the impression that some material had been torn out and rubbed across the surface. Fracture of the casting in the heavier center section verified that assumption; the structure showed a slight indication of gas absorption, but not sufficient to result in pinhole porosity.

Hence, we believe that your trouble is due mainly to loose sand particles becoming imbedded in the surface, or to some dross being carried into the mold. Possibly the sand is a little brittle and tends to be eroded or break off along the edges of the cavity and at the top of the sprue. Perhaps the molders do not see that the molds are clean before closing. You might try a small hardwood block on the molten metal at the crucible lip to hold back the dross which escapes the skimming operation.

Cast Iron Balls Contain Holes

Q.—We have a problem involving porosity in the chill-cast iron balls which we make. Balls are produced in metal molds, and we note that some of them after breaking have holes in the center while a few have a series of small holes. We will appreciate any information you can offer on eliminating the holes.

A.—The holes are shrinkage voids resulting from the change in volume from the liquid to the solid, and can be eliminated only by proper feeding. How that can be accomplished is a question that cannot be answered easily, since two main factors complicate the problem. First, of course, is the necessity of producing a ball which will wear uniformly and as slowly as possible, and the second is producing them economically. If you enlarge the sprue diameter to the point where it will be last to freeze, and thereby be able to supply molten metal continuously to the solidifying interior, it probably would be as large as the ball diameter.

If you insulated the sprue by using a core sand sleeve, and employed a neck-down core with the same curvature on the underside as the ball, it might function correctly, but would add considerably to the cost, not to mention the probability of the ball being considerably softer, due to the slower cooling rate, where the neck-down core is located.

Some improvement in reducing the size of the shrinkage void might be obtained by pouring at as low a temperature as possible. Ideally, if the metal would freeze or solidify at approximately the same rate it was poured into the mold the casting would be solid, assuming of course that the liquid and solid metal remain united. Schwartz indicates that in spheres poured with metal with low superheat, shrinkage voids do not begin to form until some time after the freezing begins, since the liquid metal contracts more slowly than the solid metal, while in the case of metal with high superheat the shrinkage void begins to form from the very moment of freezing.

Another possibility of accomplishing somewhat the same result is employment of what often is termed the "Ronceray" method (Ronceray credits the development to Saillot) of slow pouring through use of small sprues. In this method the metal is poured hot, and castings are made without heads. Some of the details of the method are presented in the Oct. 15, 1922 issue of THE FOUNDRY, and show a 150-lb casting poured through a $\frac{5}{8}$-in. sprue; an 81-lb casting poured through a 9/16-in. sprue with two 5/16-in. runners, and a 10-ton roll poured through eight $\frac{5}{8}$-in. diam gates. However, those molds were sand, and the practice might not work at all on a metal mold unless an insulating sleeve is used in the sprue.

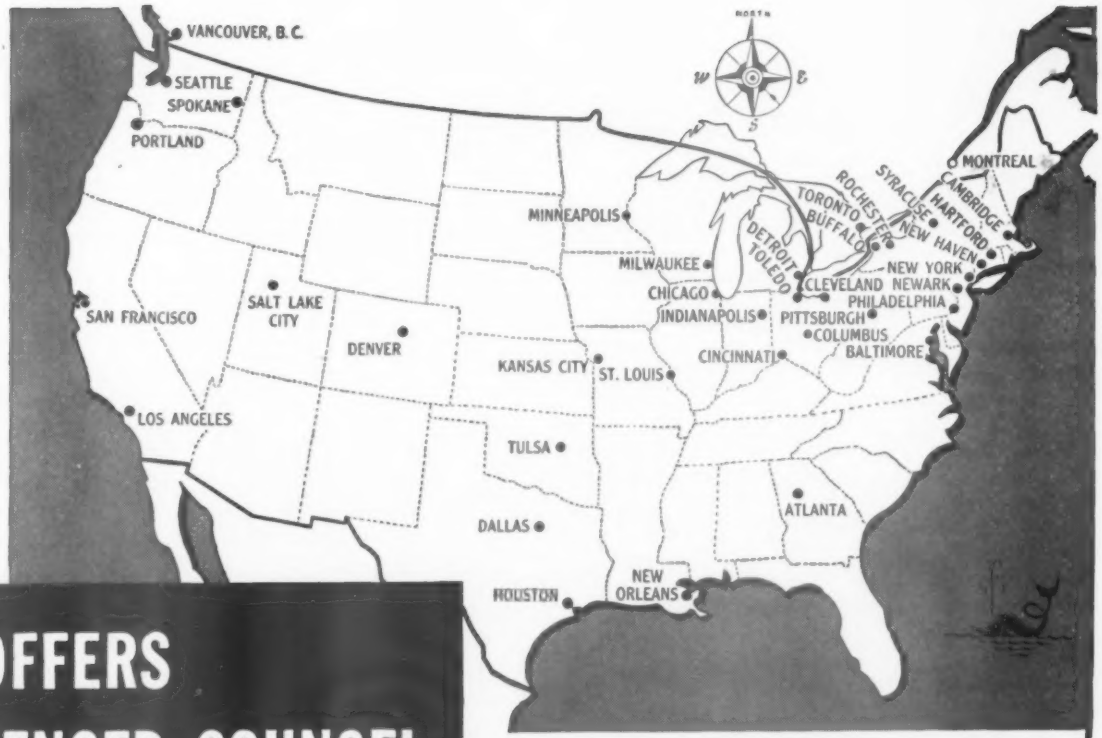
Should Contain No Free Silica

Q.—We operate a foundry in Great Britain, and are at the moment requiring to know suppliers of what we believe is a silicosis-free sand for use in our gray iron foundry. While we have no difficulty with our molding sand of today, we are anxious to locate the source of such sand as a means of improving our conditions.

A.—So far no silicosis-free sand has come to our attention. Such a material would, of course, contain no free silica and would eliminate the materials commonly used as molding and core sands. Nearest thing to such a material might be chamotte employed in France, Switzerland and to some extent here, and your familiar "compo." Chamotte is fireclay fired to high temperature and ground to suitable size, and we understand that present-day compo is ground fireclay brick. Since those materials command a higher price than the usual molding sands, they are used only as facings—being backed up with molding sand.

Possibly the use of chamotte and compo as facings might reduce the amount of free silica in the atmosphere at the shakeout and in the cleaning room, provided the facing was sufficiently thick so that there would be no disintegration, through heat, of the siliceous backing materials which produce the very fine, free-silica dust 3 microns and under to which silicosis is attributed. However, to establish that premise, one

(*Concluded on page* 102)



INCO OFFERS EXPERIENCED COUNSEL ON METAL PROBLEMS

Avail yourself of experienced counsel on problems relating to the properties, treatment, fabrication or performance of ferrous and non-ferrous metals containing nickel.

We offer consultation . . . and invite you to write, wire or phone the INCO Technical Field Section or Stock and Service Center nearest to your plant.

"INCO" TECHNICAL SECTIONS

Consultation on technical problems relating to alloys containing nickel is invited. Consult the nearest Technical Field Section of INCO Development and Research Division listed below:

CANADIAN SECTION
25 King Street, West,
Toronto 1, Ont.
Tel. Elgin 7471

CENTRAL ATLANTIC COAST SECTION
67 Wall Street,
New York 5, N. Y.
Tel. Whitehall 4-1000

CHICAGO SECTION
333 N. Michigan Avenue,
Chicago 1, Ill.
Tel. Franklin 4030

CINCINNATI SECTION
Carew Tower,
Cincinnati 2, Ohio
Tel. Parkway 1632

DETROIT SECTION
General Motors Building,
Detroit 2, Mich.
Tel. Madison 3436

EMPIRE STATE SECTION
Genesee Valley Trust Bldg.,
Rochester 4, N. Y.
Tel. Main 2393

NEW ENGLAND SECTION
75 Pearl Street,
Hartford 3, Conn.
Tel. Hartford 7-0383

PITTSBURGH SECTION
Grant Building,
Pittsburgh 19, Pa.
Tel. Atlantic 9546

ST. LOUIS SECTION
Ambassador Bldg.,
St. Louis 1, Mo.
Tel. Garfield 4197

TEXAS SECTION
Commerce Bldg.
Houston 2, Texas
Tel. Charter 4-4234

TWIN CITIES SECTION
Northwestern Bank Bldg.,
Minneapolis 2, Minn.
Tel. Geneva 0631

WEST COAST SECTION
Petroleum Bldg.,
Los Angeles 15, Calif.
Tel. Prospect 2496

STOCK AND SERVICE CENTERS FOR "INCO" PRODUCTS

The following are sources of supply for primary nickel for alloying purposes. Through casting specialists, they are prepared to offer technical service on the production of ferrous and non-ferrous castings containing nickel.

ATLANTA 3
J. M. Tull Metal & Supply Co.
285 Marietta Street
Tel. Walnut 3525

BALTIMORE 17
Whitehead Metal Products Company, Inc.
413 West North Avenue
Tel. Lafayette 2300

BUFFALO 2
Whitehead Metal Products Company, Inc.
254 Court Street
Tel. Cleveland 1475

CAMBRIDGE 39, MASS.
Whitehead Metal Products Company, Inc.
281 Albany Street
Tel. Trowbridge 6-4680

CHICAGO 23
Steel Sales Corporation
3348 South Pulaski Road
Tel. Bishop 7700

CINCINNATI 14
Williams and Company, Inc.
1921 Dunlap Street
Tel. Cherry 4700

CLEVELAND 14
Williams and Company, Inc.
3700 Perkins Avenue
Tel. Express 7000

COLUMBUS 15, OHIO
Williams and Company, Inc.
31 North Grant Avenue
Tel. Main 3291

DALLAS 9
Metal Goods Corporation
6211 Cedar Springs Road
Tel. Dixon 4-3925

DENVER 2
Metal Goods Corporation
817 Seventeenth Street
Tel. Main 9030

DETROIT 10
Steel Sales Corporation
5151 Wesson Avenue
Tel. Tyler 6-3000

HOUSTON 3
Metal Goods Corporation
711 Milby Street
Tel. Beacon 3-8881

INDIANAPOLIS 2
Steel Sales Corporation
1916 North Meridian Street
Tel. Talbot 8-1506

KANSAS CITY 2, MO.
Steel Sales Corporation
39th & Main Streets
Tel. Jefferson 1080

LOS ANGELES 21
Pacific Metals Company, Ltd.
1400 South Alameda Street
Tel. Prospect 0171

MILWAUKEE 4
Steel Sales Corporation
647 West Virginia Street
Tel. Daly 8-6840

MINNEAPOLIS 15
Steel Sales Corporation
529 South 7th Street
Tel. Nestor 6614

MONTREAL 3
Robert W. Bartram, Limited
277 Duke Street
Tel. Marquette 3281

NEWARK 5
Whitehead Metal Products Company, Inc.
205 Frelinghuysen Avenue
Tel. Bigelow 8-8500

NEW HAVEN 13
Whitehead Metal Products Company, Inc.
265 Church Street
Tel. New Haven 8-0275

NEW ORLEANS 12
Metal Goods Corporation
432 Julia Street
Tel. Canal 7373

NEW YORK 14
Whitehead Metal Products Company, Inc.
303 West 10th Street
Tel. Watkins 4-1500

PHILADELPHIA 40
Whitehead Metal Products Company, Inc.
1955 Hunting Park Avenue
Tel. Baldwin 9-2323

PITTSBURGH 12
Williams and Company, Inc.
901 Pennsylvania Avenue
Tel. Cedar 8600

PORTLAND 4, ORE.
Eagle Metals Company
809 Dekum Building
Tel. Atwater 4962

ROCHESTER 4
Whitehead Metal Products Company, Inc.
217 East Avenue
Tel. Stone 3093

ST. LOUIS 10
Steel Sales Corporation
4565 McRee Avenue
Tel. Grand 5255

SALT LAKE CITY 1
Pacific Metals Company, Ltd.
34 Richards Street
Tel. Salt Lake City 4-7059

SAN FRANCISCO 10
Pacific Metals Company, Ltd.
3100 Nineteenth Street
Tel. Mission 7-1104

SEATTLE 4
Eagle Metals Company
3628 East Marginal Way
Tel. Eliot 4764

SPOKANE 8
Eagle Metals Company
328 West Trent Avenue
Tel. Main 2419

SYRACUSE 3
Whitehead Metal Products Company, Inc.
201 Burt Street
Tel. Syracuse 5-4112

TOLEDO 2
Williams and Company, Inc.
650 East Woodruff Avenue
Tel. Adams 8102

TORONTO 5
Alloy Metal Sales Limited
881 Bay Street
Tel. Midway 7335

TULSA 3
Metal Goods Corporation
302 North Boston Street
Tel. Tulsa 4-1175

VANCOUVER, B. C.
Wilkinson Company, Ltd.
190 West Second Avenue
Tel. Fairmount 6101

EMBLEM OF INCO SERVICE

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

Questions AND Answers

(*Concluded from page* 100)

would have to make numerous dust surveys in the affected areas, and determine how much free silica is present.

Use Vacuum in Pouring Castings

Q.—We make small castings by the investment molding process, and have seen references to the use of vacuum in pouring. Can you give us any information on how that is accomplished since we believe we might be able to employ it advantageously?

A.—There are several procedures which can be employed in application of vacuum in pouring. Simplest of course, is use of a rectangular or other shape chamber with an opening on the top over which the mold can be placed. Vacuum pump line and gage are attached to the chamber. A moistened asbestos ring gasket is placed between mold and the chamber to act as a seal. In that method the mold will have to be encased in a metal flask to insure that evacuation reaches to the top of the mold.

If the mold is not encased, then a vertical cylindrical or other shape projection will have to be attached to the vacuum chamber—such that it will reach to the top of the mold, and permit attachment of a sealing ring. Again the projection may be arranged so that it does not quite reach to the top of the mold, and is curved inwardly at the top so that when the air is evacuated, the top is pulled tightly to the mold. Finally there is the method of enclosing melting unit and mold in a chamber which can be evacuated, either during the whole cycle, or just before pouring.

Defect in Bore Caused by Core

Q.—We are sending you a gray iron head blank which is poured four in a mold. These have been run a long time without trouble, but recently we experienced a defect around the core (either a shrink or blow) and have been unable to find a remedy. Sand, core, and molding are the same as in the past. Recent iron analysis showed 2.12 per cent Si, 0.60 per cent Mn, 0.114 per cent S, and 3.36 per cent TC, although we have had difficulty maintaining constant analysis due to lack of pig and good scrap. We also have experienced shrink holes in other castings that never have given trouble before.

A.—The casting submitted which is 3¾ in. in diam, 1½ in. thick with a 1-in. hole in the center shows what we believe is a distinct blow in the cored section. Therefore, we suggest that you look in that zone for the cause of the trouble. It may be due to lack of a free escape channel or vent from the core to the mold surface, or, if such is present, it may be plugged or cut off by use of a tight fitting top plate or weight.

Since the core is small compared with the mass of metal, all of the organic material will be burned out, creating a considerable volume of gas which must be carried away. While you state that there has been no change in any phase of practice, you might find that more binder is being used in the core, or that a finer sand is in use. Also it might be that the iron is being poured at a higher temperature which creates a large volume of gas in a short period.

Cores for Aluminum Grenades

Q.—We would like a step-by-step description of making sand cores for aluminum hand grenades to be cast in a permanent mold. We have a baking oven and corebox. Mixing will be done by hand.

A.—Without information on the type of corebox it is difficult to determine just what information you desire. Practice during the late war for making cores for gray iron grenades included a gang corebox with cavities for producing eight cores at one time, core driers, and a vent plate to provide the necessary vents. Cores were made in halves, the vent plate applied, and then the two half cores brought together by booking. Top half of the corebox was rapped and removed, and the core drier set in position. Core drier and corebox were rolled over which placed the drier at the bottom, and then the corebox was rapped and removed.

Since the grenade cores had only one print ⅜-in. in diam, it was found advantageous to use an oil-to-sand ratio of 1 to 45, and to provide a "hard" bake. However, that was for gray iron with a much higher heat content than you will find in the aluminum alloy. Consequently, you will have to do some experimenting to find the most suitable core mixture which will not cause any complications in removal. It probably will be advisable to use only clay-free core sand with perhaps a small amount of cereal for green strength, and the minimum amount of core binder which will provide the necessary dry strength for handling.

First Iron Tapped Comes White

Q.—We are using an all-scrap charge with addition of three to four silicon and one manganese briquets in our cupola, but are having difficulty in that the first tap sometimes comes down with white fracture iron.

A.—The first thought that comes to mind is that the silicon briquets probably were not placed in the charge, or possibly that they were put on top of the metal charge instead of following the recommended practice of placing them on the coke in the center of the cupola. You do not mention whether or not an analysis was made of the white iron to determine the silicon content, and that would be the only sure method to ascertain whether the briquets were added. The refractory coating on the briquets prevents melting until they reach the melting zone, and if they are added on top of the metal charge, the briquetted material tends to lag behind the melting iron. By placing briquets on the coke, they are first in the melting zone, and are washed by the melting iron which also gives better mixing.

Other possibilities are that the bed has not been burned through properly, and tends to cool the metal in its passage to the well. Another might be too low a bed which results in oxidized iron at the start. Succeeding coke splits bring the bed to the proper point, and no further trouble is experienced.

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SLY ENGINEERS give you the answer for your conditions. Call a Sly engineer today.

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Ask for Bulletin 98 and tell us your problem so that we can write you fully.

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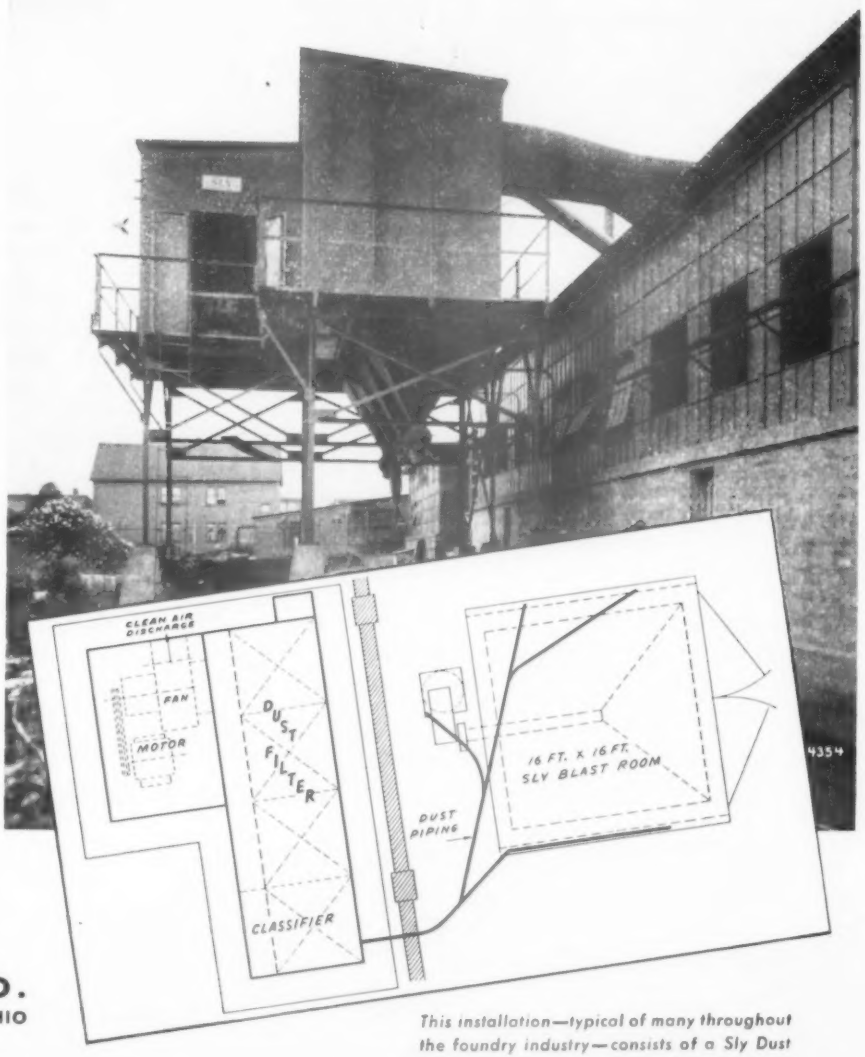

This installation—typical of many throughout the foundry industry—consists of a Sly Dust Filter exhausting a large Sly Blast Room.

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Representatives in New York • Chicago • Philadelphia • Detroit • St. Louis
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Men OF INDUSTRY

LYMAN THUNFORS has been appointed vice president-general manager, Paul M. Wiener Foundry Co., Muskegon, Mich., succeeding **William G. Grant** who has been ill for the past year and who will continue to serve the company in an advisory capacity. Mr. Thunfors, a native of Muskegon, received his professional training at Detroit Institute of Technology. He has been associated with Richmond Radiator Co., Uniontown, Pa., the last 4 years, where he was vice president in charge of manufacture. Prior to his connection with Richmond Radiator Co., Mr. Thunfors was associated with Caterpillar Tractor Co., Peoria, Ill., in various supervisory capacities, including that of foundry manager and co-chairman of the company's labor-management program during the war.

♦ ♦ ♦

John R. Pierce has been appointed foundry superintendent, the Grabler Mfg. Co., Cleveland. Following graduation from the University of Michigan in 1937, Mr. Pierce was instructor in foundry machine shop and pattern work, Case Institute of Technology, Cleveland, for 3 years. He was factory superintendent, Una Welding Co., 1940-1944, and manager-vice president, Auto Arc Welding Co., 1945-1948, both of Cleveland.

♦ ♦ ♦

Hubert Chappie has been appointed foundry superintendent at the Torrance, Calif., plant of the National Supply Co., Pittsburgh. Mr. Chappie, who has been a foundryman for 29 years, spent 20 years with the George H. Smith Steel Casting Co., Milwaukee, where he became foundry superintendent. He was associated subsequently with Lebanon Steel Foundry, Lebanon, Pa., Texas Electric Steel Casting Co., Houston, Tex., and Columbia Steel Co., San Francisco. At the time Columbia Steel Co. discontinued foundry operations at the Torrance, Calif., plant, he was foundry superintendent there.

♦ ♦ ♦

W. T. Gettig has been appointed works manager, Edward Valves Inc., subsidiary of Rockwell Mfg. Co., East Chicago, Ind., in charge of manufacturing, industrial and personnel relations, and industrial engineering. Mr. Gettig joined the company in 1933 as a machine tool operator and has successively served as methods engineer, supervisor of the methods department, assistant production manager and production manager.

♦ ♦ ♦

George N. Sieger has been elected president of the American Welding Society. Mr. Sieger, president of the S-M-S Corp., Detroit was installed at the society's annual meeting in Philadelphia during the week of Oct. 24. A graduate of Lehigh University, he is a national authority on resistance welding and is a past president of the Resistance Welder Manufacturers' Association. He has held many offices in the Society and served as first vice president last year.

♦ ♦ ♦

Ralph M. Hoffman, president, Link-Belt Co., Pacific Division, San Francisco, has been elected a vice president of the parent Link-Belt Co., Chicago. Mr. Hoffman joined the predecessor of the Pacific Coast company, Meese & Gottfried Co., in 1913. During his long service with Link-Belt Co. and subsidiaries, he has served in important executive capacities. He continues president of the Pacific Division, the position he has held since 1943.

♦ ♦ ♦

Reginald G. Ullman has been made sales manager, West Steel Casting Co., Cleveland. Before joining the West company in 1946, Mr. Ullman was associated for five years with the American Car & Foundry Co., in the Cleveland and Pittsburgh sales offices. His business experience has been devoted chiefly to sales development work in the railroad, mining, automotive trucks, agricultural and other steel casting applications.

♦ ♦ ♦

Frank F. Bonnevier has been appointed plant superintendent, Buffalo Stainless Casting Corp., Buffalo, which began production of stainless steel castings in September. Mr. Bonnevier has been associated with Frederic B. Stevens Inc., Detroit, for the last two years. Previous connections include Cooper Alloy Foundry Co., Hillside, N. J., and Allegheny Ludlum Steel Corp., Buffalo.

♦ ♦ ♦

Personnel changes affecting the Foundry Division of Caterpillar Tractor Co., Peoria, Ill., have been announced as follows: **John Nieman,** a former co-operative engineering student at Illinois Institute of Technol-

(*Continued on page* 106)

LYMAN THUNFORS

JOHN R. PIERCE

HUBERT CHAPPIE

W. T. GETTIG

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Our Own Source of Ore

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(*Continued from page* 104)

ogy, with 13 years of experience in patternmaking and design, has been appointed general foreman of the large coreroom, succeeding **Robert Hodgson,** who has left the company. **Clarence Turner,** a Caterpillar foundry apprentice graduate with several years of supervisory molding experience, has been named foundry superintendent in charge of all foundry operations on the second shift. **Russell Zimmerman,** who has been general foreman on the second shift, has been named to that position on the third shift. **Luke Gunn,** general foreman of small molding, and **Earl Biddison,** general foreman, have been appointed in charge of all molding operations on the first and second shifts respectively.

♦ ♦ ♦

Dr. Harry P. Croft has been appointed vice president in charge of development for Wheeling Bronze Casting Co., Wheeling, W. Va. Dr. Croft formerly was associated with the Chase Brass & Copper Co. Inc. as director of technical control and research in the Midwestern Division. He served as copper consultant, Bureau of Conservation, Office of Production Management, Washington, during the early part of the war, and later as chief of the Industrial Division, Cleveland Ordnance District.

♦ ♦ ♦

Orrin E. Fenn has joined Newcomb-Detroit Co., Detroit, as chief engineer of the Grand Rapids, (Mich.) Division, which manufactures industrial air handling equipment. He will also head up sales engineering for the company in western Michigan, Indiana, Illinois and Wisconsin. Mr. Fenn has been in the industrial air handling equipment field for over 20 years. Previous connections include Peters-Dalton Co. and R. C. Mahon Co., both of Detroit.

Harry P. Smith, formerly New York district sales manager, Mathieson Chemical Corp., has been appointed assistant general manager of sales with headquarters in the company's New York office. Mr. Smith, a graduate of Columbia University, was president of the George Chemical Co., now a division of Diamond Alkali Co., Cleveland, prior to joining the Mathieson sales department in 1944.

♦ ♦ ♦

Charles R. Marshall and **Lloyd Veitch** have been appointed managing directors of Industrial Foundry Supply Co., San Francisco and Oakland, Calif., affiliate of Independent Foundry Supply Co., Los Angeles. Mr. Marshall, who has been associated with the foundry supply and equipment business both in the East and in California, is secretary of the Northern California Chapter, American Foundrymen's Society. Mr. Veitch, a native of Oakland, has been active in the foundry and industrial sand industry for many years.

♦ ♦ ♦

Roland Whitehurst has been elected vice president in charge of sales, the Electric Storage Battery Co., Philadelphia, succeeding **Frank T. Kalas,** who has retired following 49 years of service. Mr. Whitehurst joined the New York branch of the company 40 years ago and served as manager of the Washington branch for 20 years. In 1940 he was appointed assistant sales manager and in 1944 became sales manager.

♦ ♦ ♦

William S. Begg has been appointed vice president and secretary, American Steel & Pump Corp., New York, of which Oklahoma Steel Castings Co. Inc., Tulsa, Okla., is an operating subsidiary. Mr. Begg was graduated from the law school of Yale University and has been associated with Willkie Owen Farr Gallager & Walton, New York attorneys, for the last 15 years. He will make his headquarters in the executive offices of American Steel & Pump Corp., New York.

♦ ♦ ♦

Raymond P. Wiggers has been appointed advertising manager, the Frank G. Hough Co., Libertyville, Ill., manufacturers of road building and material handling equipment. Mr. Wiggers was graduated from Western Reserve University and was formerly associated with Towmotor Corp. and Parker Appliance Co., Cleveland.

♦ ♦ ♦

G. A. Gilbertson has joined the Frank G. Hough Co., Libertyville, Ill., as vice president. Mr. Gilbertson resigned recently as assistant sales manager of the Industrial Power Division, International Harvester Co., Chicago.

♦ ♦ ♦

Sylvester Wabiszewski, president, Maynard Electric Steel Castings Co., Milwaukee, was honored Oct. 17, at a dinner, sponsored annually by the Milwaukee Society of the Polish National Alliance. Mr. Wabiszewski was presented with a plaque in recognition of his leadership as an American of Polish descent.

♦ ♦ ♦

E. H. Mebs, until recently division superintendent of foundries, Johnstown-Lorain Works, Carnegie-Illinois Steel Corp., Johnstown, Pa., has been appointed to the newly created position of works manager, Machined Steel Casting Co., Alliance, O.

♦ ♦ ♦

Dr. John G. Dean has been appointed head of the industrial chemicals section, Development and Research Division, International Nickel Co. Inc., New York. **O. B. J. Fraser,** assistant manager of the research di-

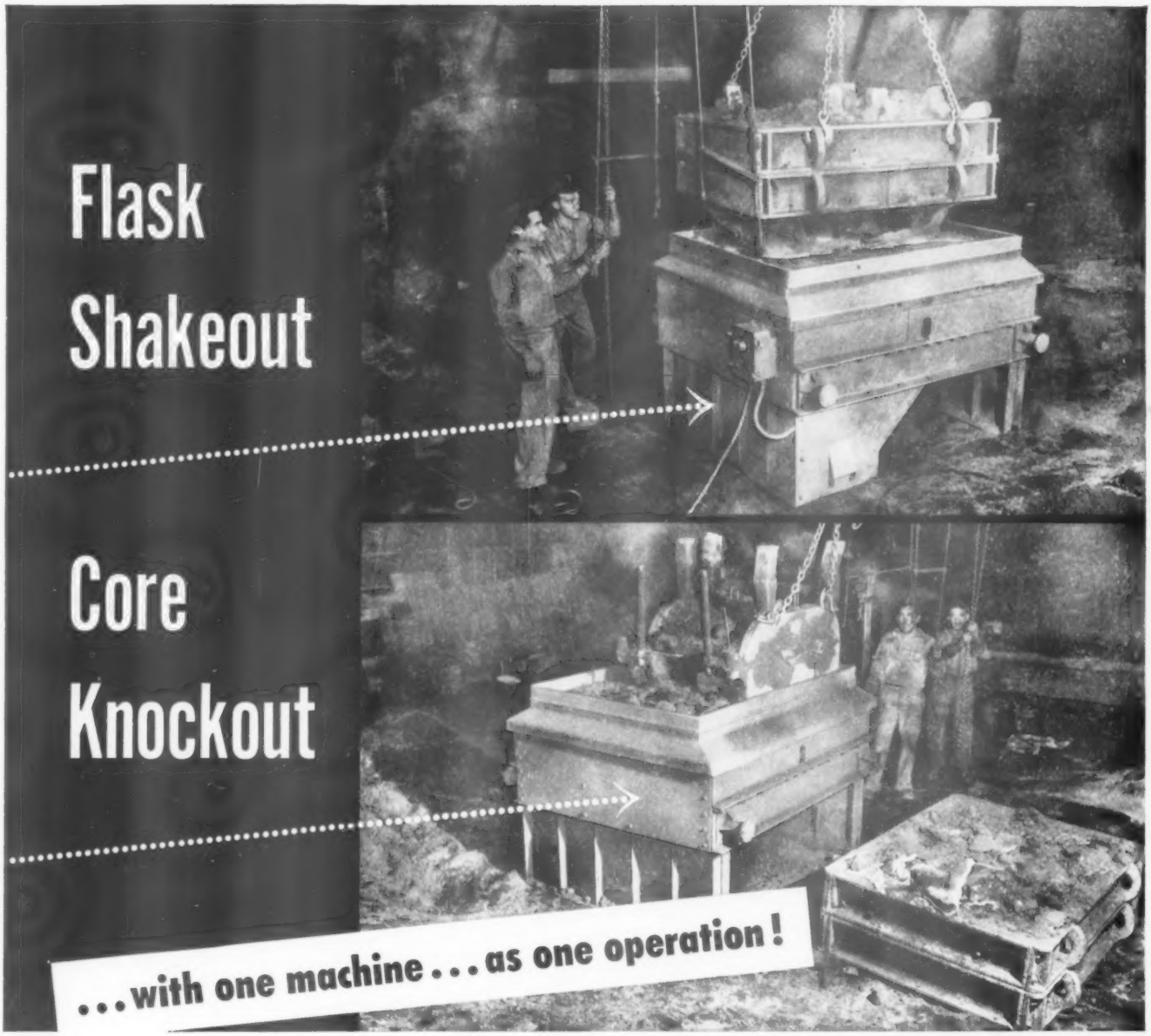
(*Continued on page* 110)

DR. HARRY P. CROFT

ORRIN E. FENN

HARRY P. SMITH

CHARLES R. MARSHALL



Only the Robins Floatex Shakeout can perform these two foundry operations without removing the casting!

No wonder this Robins Floatex Shakeout is saving time . . . money . . . headaches.

First, it shakes out the 5800-lb. flask, containing a 2600-lb. casting with a 1200-lb. core. Time: 3 minutes. *Then, while the casting remains on the deck,* it knocks out the core! Knockout time: 2 minutes.

No longer need the casting be taken to another point on the foundry floor, where men remove the core with sledges or mechanical hammers! The entire job is done as *one* operation with *one* machine.

Only the Robins Floatex Shakeout is powerful enough to knock out heavy cores as well as to shake out flasks—without damaging either! And only the Robins Floatex Shakeout is genuinely full-floating; it shakes the flask, not the foundry!

What is more, *only* the Floatex has a stroke adjustable to each shakeout or knockout requirement . . . from a unit as big as the hull of a General Sherman tank to one as small as a household valve.

Whether you want to do shakeout and knockout as a single operation or shakeout at night and knockout in daytime (when machine would otherwise be idle), write Robins.

Learn how both jobs can be done with *one* machine . . . by making only *one* investment.

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WRITE TODAY. Learn how you can save time, money and headaches by installing a Robins Floatex Shakeout. Made in portable and stationary types—with or without automatic, mechanical self-discharge feature. Address Robins Conveyors Division, 270 Passaic Avenue, Passaic, N. J.

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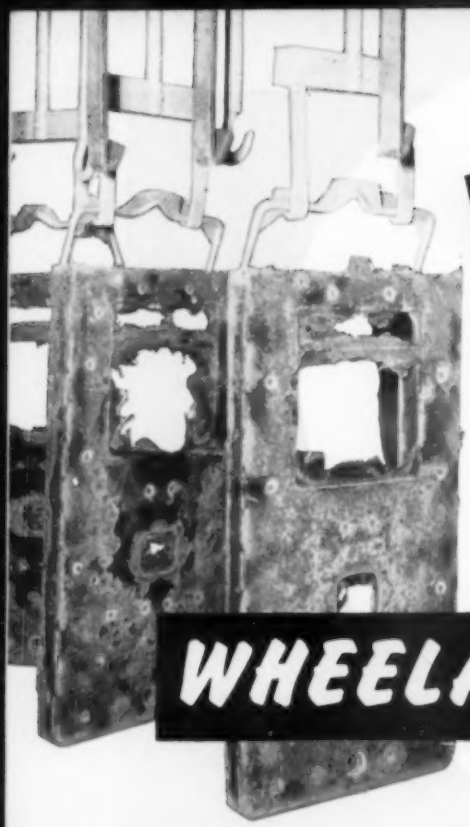

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WHEELABRATOR® cleans radiator an

Time is money. And whenever the Airless "WHEELABRATOR" is put to work it cuts hours of blast cleaning time every working day. The torrent of abrasive thrown by the Airless Wheelabrator, under perfect control, strips every semblance of scale and sand from the most intricate castings, leaving them brilliantly clean.

Utilizing a centrifugal wheel, the Airless Wheelabrator throws more abrasive and throws it harder per horse power expended than any other blasting device ever conceived. The Wheelabrator principle has been incorporated in a variety of machine sizes and types to provide the right equipment for every blast cleaning job.

TYPICAL PERFORMANCE on Radiators and Boiler Sections

An Eastern manufacturer* is using a Wheelabrator Monorail Cabinet for cleaning Boiler and Radiator Sections. The castings are carried in a straight line through the abrasive blast at a speed of ten feet per minute. Eight work-laden hooks pass through the machine in this period of time with exceptionally large pieces requiring the use of two hooks.

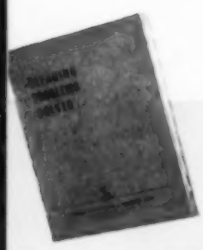
★ ★ ★

With the installation of a No. 2 Wheelabrator Multi-Table at the Babcock and Wilcox Co., Barberton, Ohio, more boiler wall blocks were cleaned in the first thirty minutes of operation than one man could clean in a full day with a sand blast unit.

★ ★ ★

A Wheelabrator Plain Table and a 36″ x 42″ Wheelabrator Tumblast installed at Foster Wheeler Limited, St. Catharines, Ontario are cleaning approximately 12 tons of gray iron boiler and stoker castings daily. The Wheelabrator is cleaning work in 3 minutes . . . and doing a more perfect job than they could achieve in 45 minutes with their previous barrel method.

*Name on request



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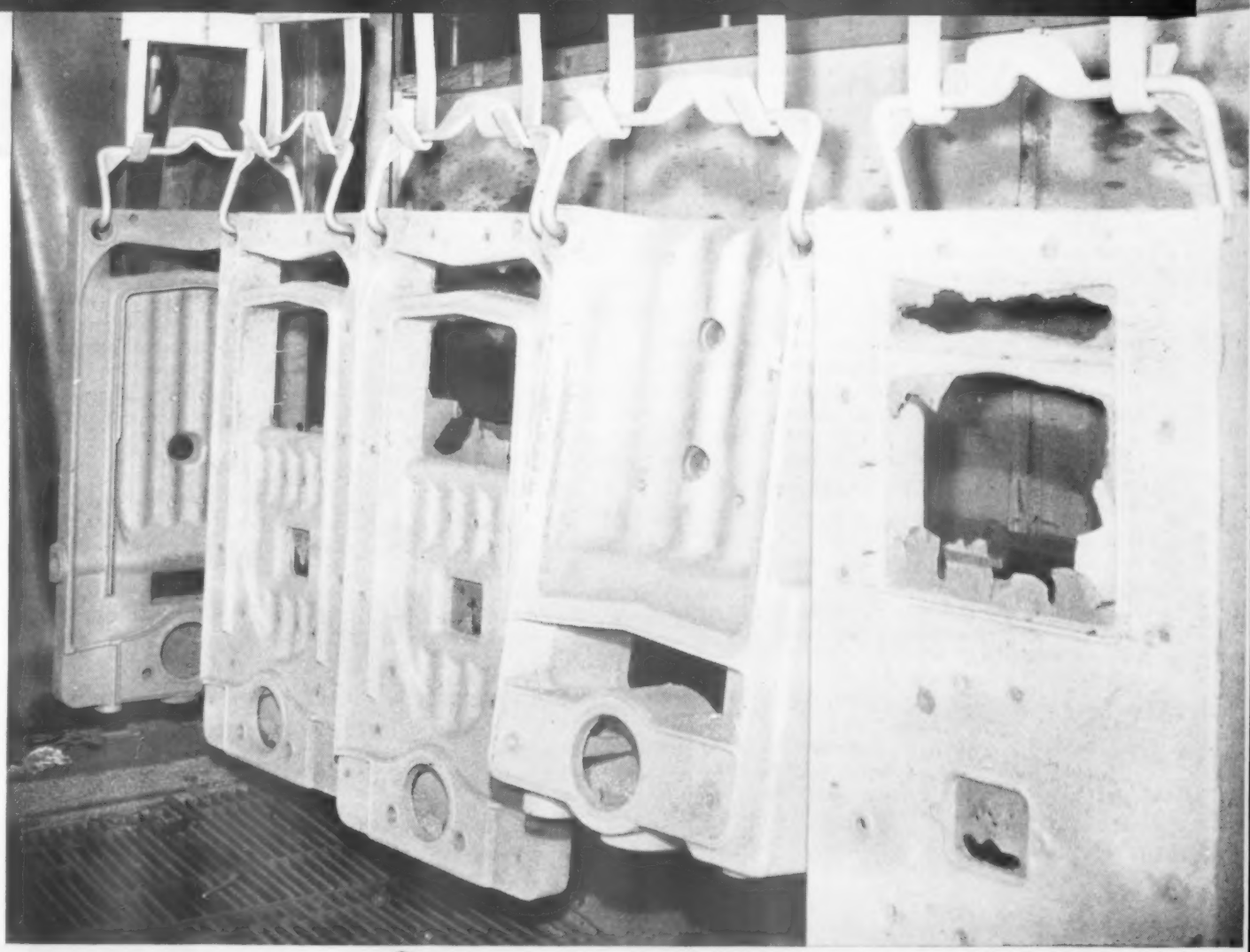
WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

or and boiler sections in record time



American

WHEELABRATOR & EQUIPMENT CORPORATION

505 S. Byrkit Street — Mishawaka 2, Indiana

(*Continued from page* 106)

vision, had been directing the section previously. Dr. Dean was graduated from Brown University and following graduate work at Columbia University joined the research department of the Permutit Co., New York, where for several years he served as director of its laboratory research division.

♦ ♦ ♦

William J. MacNeill has been named assistant to the president, the Dayton Malleable Iron Co., Dayton, O. **E. J. Stockum,** a vice president of the company, succeeds Mr. MacNeill as general manager of the company's G. H. R. Foundry Division. Mr. MacNeill, a native of Wisconsin, joined Federal Malleable Co., West Allis, Wis., in 1919, and resigned as president and general manager of that organization in 1945 to become general manager of the G. H. R. Foundry Division. He is a national director of the American Foundrymen's Society and served as president of the Wisconsin Chapter of that organizaiton in 1939-40.

♦ ♦ ♦

R. R. Griner has been appointed western sales agent, the Electric Furnace Co., Salem, O., with headquarters in Kansas City, Mo. Mr. Griner until recently has been furnace engineer for Wright Aeronautical Corp., Paterson, N. J. Prior to that he was erection and service engineer with the Electric Furnace Co. He has had extensive experience in the selection, design and maintenance of industrial furnaces and will now be available for consultation on development, sales and service problems.

♦ ♦ ♦

Daniel A. Schaitberger has been elected vice president in charge of sales, Northern Engineering Works, Detroit. Mr. Schaitberger has been in the company's sales department since 1927, and has also assisted in development of crane and hoist controls, as well as an electric operating conversion unit for hand powered cranes.

♦ ♦ ♦

Walter A. Zeis has been appointed exclusive representative in Missouri and southern Illinois for Werner G. Smith Co., Division of Archer-Daniels-Midland Co., Cleveland, manufacturer of core oils. Mr. Zeis has operated his own foundry supply company since 1937 and prior to that

WALTER A. ZEIS

was associated with the pattern department of American Steel Foundries, Chicago. For many years Mr. Zeis has been an active member of the St. Louis District Chapter, AFS, which he has served as a director

♦ ♦ ♦

Lewis W. Metzger has been elected executive vice president, the Midvale Co., Philadelphia. Mr. Metzger will retain his former positions as vice president and assistant to the executive vice president, Baldwin Locomotive Works, Philadelphia.

♦ ♦ ♦

W. W. Coleman, chairman of the board of directors, Bucyrus-Erie Co., Milwaukee, was honored at the annual dinner of the South Milwaukee Association of Commerce, held at the city's high school Oct. 20, for his contribution to the community's growth. Principal speaker at the meeting was **William J. Grede,** president, Grede Foundries Inc., Milwaukee.

♦ ♦ ♦

Herman C. Phelps, until recently West coast regional sales manager with headquarters in Seattle for All-State Welding Alloys Co. Inc., White Plains, N. Y., has been named sales manager of the company. Located in White Plains, Mr. Phelps will supervise sales and service for the All-State low-temperature welding and brazing alloys and fluxes.

♦ ♦ ♦

Victor E. Dolan has been appointed special representative in Chicago for the Cleco Division, Reed Roller Bit Co., with headquarters at 121 North Jefferson St. Mr. Dolan will act as liaison between the general sales office in Houston, Tex., and local dealer organizations.

♦ ♦ ♦

M. E. Brooks, formerly foundry engineer, Bay City Division of Dow Chemical Co., Midland, Mich., has been appointed to the engineering staff of Magnesium Alloy Products Co., Compton, Calif. Mr. Brooks will act as advisor on technical details of magnesium foundry operation.

♦ ♦ ♦

R. E. W. Harrison has resigned as vice president, Chambersburg Engineering Co., Chambersburg, Pa. Mr. Harrison will devote his time to a limited number of business interests, principally in a technical advisory capacity.

♦ ♦ ♦

W. F. Godejohn has been appointed assistant to the president, Harbison-Walker Refractories Co., Pittsburgh. Mr. Godejohn was formerly Missouri district superintendent with jurisdiction over the Vandalia and Fulton

(*Concluded on page* 113)

WILLIAM J. MacNEILL

R. R. GRINER

DANIEL A. SCHAITBERGER

THESE BENEFITS CAN JUST AS WELL BE YOURS

THE JOHN BERTRAM & SONS CO. LIMITED
MACHINE TOOLS
DUNDAS, CANADA

BERTRAM

Dear Sirs:

The Hydro-Blast recently installed in our foundry has proved itself to be a very valuable unit.

Unsolicited, our foundry employees have expressed their appreciation for the elimination of dust while the cleaning work is in progress. Added to this, of course, is the saving we have made in removing cores and cleaning castings, over the method previously used.

By conservative estimate of average times for different types and sizes of castings, we have reduced cleaning time 40 per cent; and for cleaning our 42" Planer Bed casting, we reduced the time 65 per cent. We feel sure that as our men become more familiar with the technique of operating the Hydro-Blast, greater savings will be made.

Yours very truly,
THE JOHN BERTRAM & SONS CO., Ltd.
N. J. Dinelagos
Vice President and General Manager

..... Nothing unusual about this—varying only in degree, it happens wherever and whenever Hydro-Blast is installed.

You'll find Hydro-Blast engineers good men to talk to, concerning your own cleaning and dust problems.

FOREIGN REPRESENTATIVES

ENGLAND—Pneulec Limited, Licensee, Smethwick (near Birmingham).

FRANCE AND SWITZERLAND—R. Dureuil, 4 Square Du Graisivaudan, Paris 17, France.

FINLAND—Industria Osakeyhtio, Sodra Esplanadgatan 14, Helsingfors, Finland.

BELGIUM—Charles Monseur, 195 Rue Saint Leonard, Liege, Belgium.

NORWAY, SWEDEN, DENMARK—Kollbye and Danielsen, Fridtjof Nansens Plass 6, Oslo, Norway.

HYDRO-BLAST

Chicago 47, Illinois

2550 NORTH WESTERN AVENUE

THIS MONTH, 62,562* BUYERS OF CASTINGS WILL READ THIS AD...

This is one of a series of 6 full page ads emphasizing the expanding industrial acceptance of Brass Castings. Nationally circulated in outstanding trade journals and read by manufacturers, engineers, contractors, metallurgists, production control men—*these messages reach the men who specify and influence the purchasing of castings!*

R. Lavin & Sons, Inc.

PUMP MANUFACTURERS SPECIFY BRONZE

Because of its Resistance to Corrosion... Pressure Tightness and Anti-Frictional Characteristics

Bronze pumps are used in every phase of modern civilization. Pumps are required to convey corrosive liquids in industry, sea water in our navy's ships, water in fire extinguishing equipment and waste in sewage disposal systems. Pressure tightness, resistance to corrosion, strength, ductility and anti-frictional characteristics are some of the qualities required of pump materials. Wherever liquids are used... *in home or in industry*... pumps with essential Bronze parts play a vital role.

Specify—LAVIN NON-FERROUS INGOT—*Quality*

R. LAVIN & SONS, INC.
Refiners of Brass, Bronze and Aluminum
3426 SOUTH KEDZIE AVENUE · CHICAGO 23, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

REPRINTS OF ENTIRE *Brass Castings* SERIES ARE YOURS FOR THE ASKING

The Foundryman's Problems . . . Are Our Problems!

* Audited Circulation plus pass-on readership.

(*Concluded from page* 110)

plants of the company. For many years he was engaged in mining, manufacturing and administrative phases of the refractories industry in the St. Louis area.

♦ ♦ ♦

Herman B. Campbell, vice president in charge of operations, Harbison-Walker Refractories Co., Pittsburgh, has retired following 44 years of service. Mr. Campbell served as superintendent of various districts of the company. In 1922 he went to Pittsburgh and served as department head of the works and mines department and has been operating vice president since 1939.

♦ ♦ ♦

Frank J. Dvorak, assistant to the president, and **Roy J. Sund,** assistant to the vice president, Marathon Corp., Rothschild, Wis., have been elected directors of the company. **Donald A. Snyder,** director of sales, has been elected a vice president.

♦ ♦ ♦

Dr. Karl T. Compton has resigned as president, Massachusetts Institute of Technology to accept the position of chairman of the Military Establishment's Research and Development Board, succeeding Dr. Vannevar Bush.

Apprentice Training Is Discussed

Consideration of the possible establishment of a national committee to develop basic work processes and related trade subjects which could be used as a guide by all foundries in setting up apprentice training programs was given at a meeting held at Hotel Kimball, Springfield, Mass., Oct. 19-20. Meeting was sponsored by the Apprentice Training Service, Department of Labor, and under the direction of R. B. Brown, New York.

About 40 foundry, vocational and labor representatives of the New England states and New York discussed various phases of obtaining and training apprentices. Chairmen of discussion periods included J. W. O'Toole, Crompton & Knowles Loom Works, Worcester, Mass.; Dr. Charles T. Klein, New York State Department of Education, Albany, N. Y.; Alphonse Stein, International Molders' and Foundry Workers' Union of North America, New York. During the discussions it was pointed out that a concerted effort should be made by industry to make the physical surroundings more attractive, and that wages for apprentices should be on a par with those in other industries. It also was suggested that foundry tours for high school students would give them a better idea of foundry work and the skills involved.

Harry Heinman, Connecticut Department of Labor, stated that he believes the best procedure to attract apprentices is to develop what he termed "a package" and then proceed to sell it to the public. The package, he said, must be prepared by co-operation of both management and labor, and include such items as advantages of being an apprentice in the foundry field, details of the training program including wages, and the long-time benefits. Those can be worked out for local areas and publicized through the newspapers.

Dr. Klein discussed methods of securing adequate related instruction and class attendance. Requests to local boards of education usually will result in provision for operation of a course in related instruction. Competent instructors can be selected by a foundry committee co-operating with the educational authorities, and likewise a course of related instructions can be developed through a careful study of the voluminous available literature. Attendance can be secured by a good course, well taught, financial incentives, and co-operation of employer-employee and joint apprenticeship committees.

Other discussions related to preparation of suitable training programs which would be flexible enough for a variety of foundries, and methods of insuring that the apprentice is moved from one work process to another as soon as he has fulfilled the necessary requirements. Maintenance of accurate records of work processes performed and good supervision will eliminate trouble along that line.

Foundry Congress Held at Prague

The International Foundry Congress held at Prague, Czechoslovakia, Sept. 13 to 18, was organized by the Czech Foundry Technical Association, of which Prof. Eng. Fr. Pisek has been president for 25 years and with L. K. Jenicek as honorary secretary. The congress, first in Prague in 15 years, was highly successful with delegates from many countries present.

At the opening meeting, Professor Pisek greeted the foreign visitors and referred to the fact that the Czech association had been founded 25 years ago. Dr. Plesinger then reviewed the position of the Czech foundry industry under present economic and social conditions. In 1948, the iron, steel and malleable foundries became nationalized in the proportions of 96, 100 and 99.4 per cent, respectively. Industrialization of Slovakia is now proceeding apace; steps are being taken to equalize production between Bohemia and Moravia.

It is thought that the gradual specialization of the foundries will make it possible to mechanize many operations. Already expectations have been realized, since in 1947 the iron, steel and malleable foundries have met the requirements of the biennial plant to the extent of 122, 106 and 98 per cent, respectively, and for the first eight months of 1948 the percentages were 105, 117 and 102 per cent.

Dr. Ing. Jaroslav Jicinski, assistant general manager of the nationalized concern of Ceskoslovenske Hute, spoke of the necessity for obtaining collaboration between designers, patternmakers and molders, and expressed the ideal of the founder as not trying to do everything and anything.

Most of the papers presented at the congress were in the Czech or Slavic languages, although a portion of these were summarized in French and English.

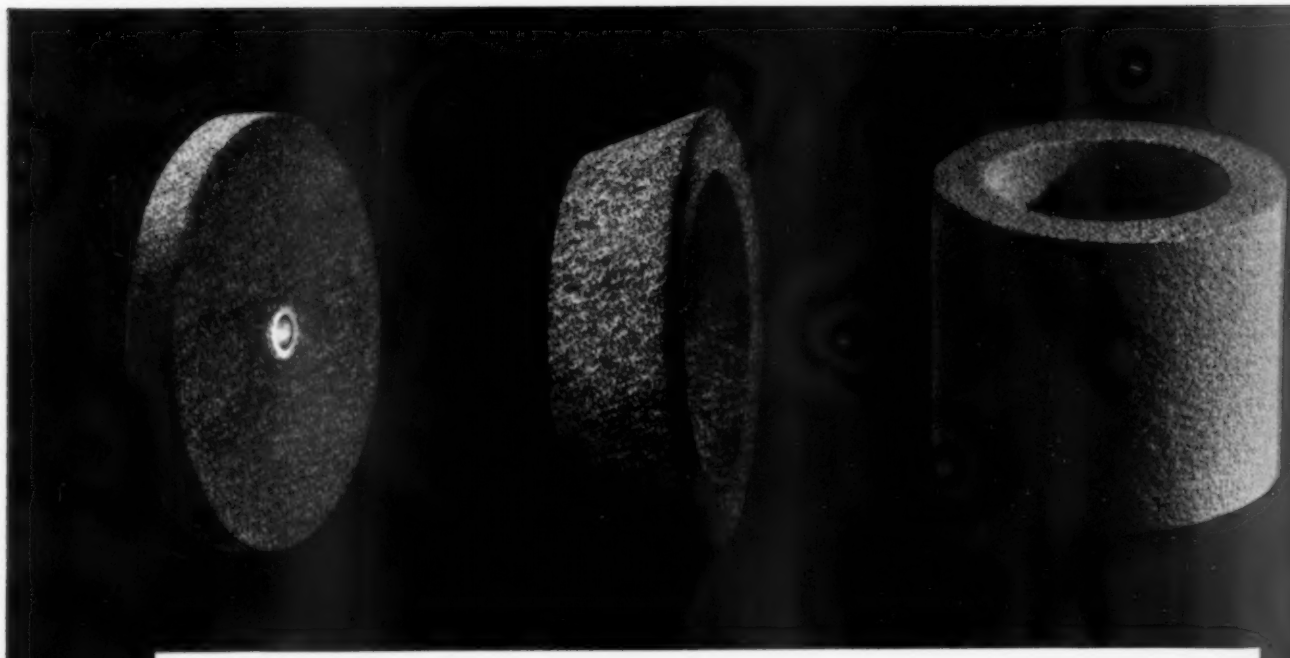
The program comprised 41 papers, including an exchange paper presented by Lester B. Knight, Lester B. Knight & Associates Inc., Chicago, on behalf of the American Foundrymen's Society.

Among the subjects presented were the recruitment and training of molders, foundry mechanization and air conditioning, the pressing of iron and scrap into briquet and a discussion of feeders and risers. A number of papers were devoted to control and research, malleable iron foundry practice and noferrous foundry practice.

Plant visitations were arranged for those who wanted to observe operations in some of the local foundries.

Buyers and Sellers Study Metals

Institute of Metals for Buyers and Sellers, organized and directed by Cleveland College of Western Reserve University in co-operation with the National Association of Purchasing Agents in Cleveland, is offering a schedule of 36 weekly sessions covering various phases of metallurgy. Sessions began Sept. 28 and will continue to June 7, 1949. Aim of the institute is to consider general principles involved in production, fabrication, and properties of iron, steel, nonferrous metals and their alloys, with special reference to practical problems in buying and selling them.



Trim high grinding costs for Christmas

Grinding costs can take a trimming this Christmas season and for many seasons to come. If you would like to shape your production costs by paring down your dressing expenses, sprucing up high stock removal and long wheel life, Peninsular engineers may be able to help you.

Manufacturers in over fifty industrial fields have been shown how to trim down grinding costs by Peninsular consultants. Since 1889, Peninsular has had a program of study and experimental research designed to help them with their particular grinding problems. *Why not call on Peninsular engineers to study your grinding job?*

First, they will conduct an on-the-grounds analysis of your grinding machines, the methods you employ, and the materials you grind. Correct wheel formulas are then drawn up and presented to you. Our engineers will include recommendations developed to reduce your costs and increase your production.

Thought for any season: Every Peninsular grinding wheel is specifically designed for a particular grinding job.

The Peninsular Grinding Wheel Co., 729 Meldrum Avenue, Detroit 7, Michigan. *Sales Offices:* Chicago, Philadelphia, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

PENINSULAR

INDIVIDUALLY PENINSULAR *ENGINEERED*

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS

This Christmas tree, made of standard sizes and types of Peninsular grinding wheels, gained such favorable comment in its original appearance that it is again reproduced with season's greetings from Peninsular.

SOUTHERN SCHOOL ADDED TO FEF GROUP

University of Alabama To Offer Foundry Program

PLANS are being completed to make the University of Alabama at Tuscaloosa the seventh Foundry Educational Foundation school to serve the foundry industry of southeastern United States. This region includes Tennessee, North and South Carolina, Florida, Georgia, Alabama, Mississippi, plus New Orleans and Baton Rouge in Louisiana.

The interest and activity of leading foundrymen in the area has made this move desirable as a means of serving an important foundry district in a part of the country inadequately served by the present FEF schools. Activity began with information delivered to the FEF trustees at their regular meeting May 3. The trustees considered and agreed that it was advisable to provide a link in the FEF schools, in view of this request.

Under the further guidance of James T. MacKenzie, technical director of the American Cast Iron Pipe Co., Birmingham, certain southern schools were investigated and the University of Alabama selected because of its proximity to a wide range of foundry operations which will serve to supplement the laboratory activities of the foundry program. Dr. MacKenzie has been appointed chairman of the Alabama Advisory Committee. The program was formally launched at a luncheon meeting Oct. 15 attended by the executives of the industry from Birmingham, Tuscaloosa, Anniston, Gadsden, Knoxville and Chattanooga, as well as President John M. Gallalee, Dean James R. Cudworth, Prof. E. C. Wright and Assoc. Prof. Robert B. Oliver of the University of Alabama.

The foundry program will be set up in the College of Engineering under Dean Cudworth and will be actively directed by Professor Wright. The metallurgy department is new at the university and is offering a degree in metallurgical engineering and is serving the other departments of the college in such a manner as to make it possible for all engineers to prepare themselves for the industry. Chemical, mechanical, industrial and mining engineers all are required to take introductory courses in metallurgy. From these, they will be able to enter directly into foundry studies which are being set up as follows:

1. **Fundamentals of the Casting Process**—A study of the metals of this foundry process identifying the technology and engineering required of foundry operations and stressing the industry as a source of metal parts from the standpoint of the engineer who will eventually design and use castings.
2. **Foundry Technology I**—A study of the application of science to foundry operations. The prior engineering fundamentals are focused upon the problems and operations of the foundry. Includes control of materials and process, maintenance of tolerances, metallurgical inspection and repair.
3. **Foundry Technology II**—Continuation of I.
4. **Foundry Technology III**—Study of advanced foundry problems and method of inquiry.
5. **Casting Design**—A study of patterns, molds, dies and casting designs in their relationship to each other in the engineering of a foundry product. Emphasis on design of casting for metallurgical perfection.

These required foundry studies will be incorporated into an option in the metallurgical engineering curriculum which will also include the following required courses: 1. Accounting for Engineers. 2. Business Law. 3. Industrial Organization. 4 Motion and Time Study. 5. Technique of Executive Control.

The Engineering College is also installing a series of studies in the humanities, as follows:

1. **Man and His Behavior**—Human behavior and experience; problems in behavior; group behavior; experimental and observational techniques in the social sciences.
2. **Foundations of the Modern World**— Civilizations; the genesis of Western civilization; the developing crisis in Western civilization.
3. **The Government of Contemporary Society**—Evolution of government; comparative government; our present government; governmental administration; international relations; the present crisis; government and the future.
4. **Problems of Philosophy**—A study of the question: How does man obtain reliable knowledge?

A group of 31 other engineering and business subjects have been selected as the recommended electives which are available to all engineering students. Of unusual interest is a course in ceramics which will be of value to foundry students desiring to enter the plumbing goods industry.

Personnel for the foundry industry can also be obtained from the same university through the College of Commerce and Business Administration. The presence of a School of Education will also make practical the later development of a program for the training of foundry instructors.

Dean Cudworth and Professor Wright have stressed their intention to conduct all foundry laboratory work on an engineering level. The resulting graduates should be fully equipped for the ultimate management and technical improvement of foundry operation.

Will Be Financed Locally

It is the intention of the Southeastern region to finance the conduct of the program at Alabama from funds to be solicited within the area, which includes 35,000 foundry workers and over 400 foundries.

Prof. E. C. Wright, head of the Department of Metallurgical Engineering at Alabama, holds degrees from the University of Michigan and University of Pittsburgh. Starting his educational work at the University of Alabama in 1921, he left there in 1926 to become chief metallurgist of the National Tube Co., Pittsburgh, where he later became assistant to the president. He remained with the company 21 years.

Robert B. Oliver, associate professor of metallurgical engineering was graduated from Ohio State University with a degree in metallurgical engineering and received his master's degree from the University of Alabama. He has been a member of the latter's faculty since 1939.

Prof. James R. Cudworth, dean of the College of Engineering, was graduated from Massachusetts Institute of Technology and took graduate work there and at Harvard and the University of Alabama. Before joining the latter in 1923 he served with the U. S. Smelting & Refining Co. and the American Metals Co. He was appointed dean of the College of Engineering in 1946.

PROF. E. C. WRIGHT

PROF. ROBERT B. OLIVER

DEAN JAMES R. CUDWORTH

INTERNATIONALS

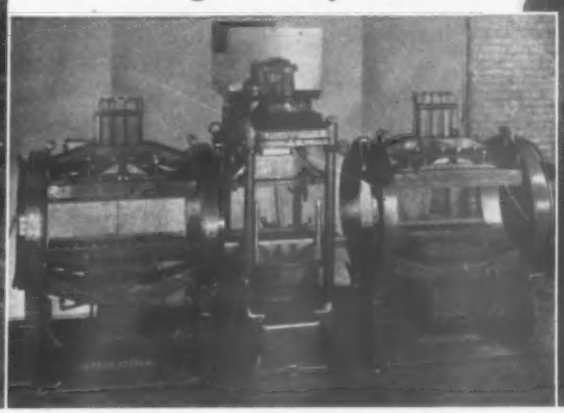
90 Standard Types
1400 Different Sizes

Many Special Designs to meet Special Requirements

Foundries in which MAXIMUM PRODUCTIONS are maintained are equipped with

INTERNATIONALS

INTERNATIONAL MOLDING MACHINE CO.
La Grange Park, Illinois

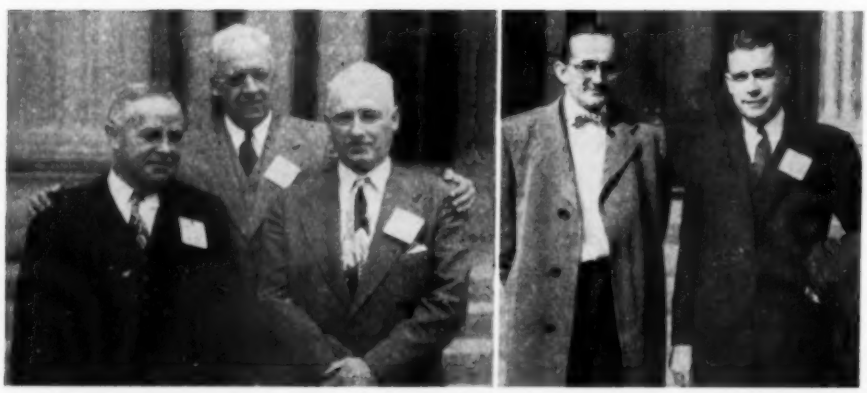


EIGHTH NEW ENGLAND FOUNDRY CONFERENCE

Attracts Nearly 400 Foundrymen to M.I.T.

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

AN INTERESTING program covering a wide range of topics was presented to nearly 400 foundrymen attending the eighth annual New England Foundry Conference. Held at Massachusetts Institute of Technology, Cambridge, Mass., Oct. 22-23, the meeting was sponsored by the New England Foundrymen's Association, Massachusetts Institute of Technology, Connecticut Foundrymen's Association, Connecticut Non-Ferrous Foundrymen's Association, Non-Ferrous Founders' Society, and American Foundrymen's Society. Committee on conference arrangements was headed by Chairman David L. Parker, General Electric Co., Lynn, Mass., and Vice-chairman Arthur F. Dockry, H. & B. American Machine Co., Pawtucket, R. I.



Foundrymen representing all parts of New England gathered at Massachusetts Institute of Technology to make the two-day conference an outstanding success. Bottom left shows the entertainment committee. Photos courtesy C. A. Wyatt, Debevoise-Anderson Co., Boston

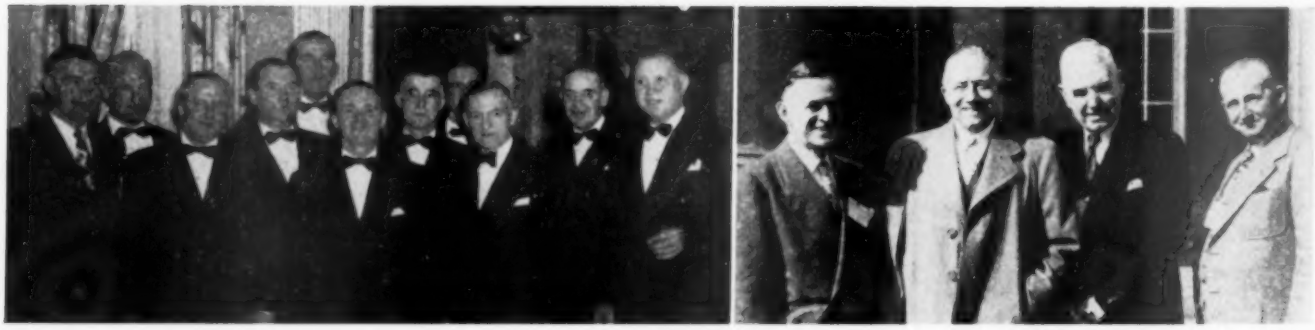
Mr. Dockry presided at the opening session at which Thomas K. Sherwood, dean of engineering, M. I. T., presented the address of welcome. He stated that the institute welcomed the opportunity of again co-operating with foundrymen especially since a number of students are recipients of scholarships granted by the Foundry Educational Foundation. He pointed out that the university or college part in educating future foundrymen was to teach the basic principles of physics, chemistry, metallurgy, etc., which could be applied, but the actual teaching of the techniques of foundry operation must be done by the industry.

T. F. Worth, General Electric Co., Lynn, Mass., presided at the first technical session at which F. Schumacher, Cooper Alloy Foundry Co., Hillside, N. J., spoke on plastic patterns, and O. A. Carlson, Carlson Pattern Shop, Springfield, Mass., discussed pressure casting of aluminum matchplates. Mr. Schumacher described the procedure of making a plastic pattern which includes use of a plaster mold whose cavity is formed from the master pattern. He pointed out that plastic patterns could be produced rapidly at a comparatively low cost; that they had smooth surfaces which permitted drawing from the sand without stickdowns, and that intricate detail was produced without trouble. The plastic material has a low shrinkage, about 1/16-in. per ft, and can be cured or polymerized in 4 to 6 hr.

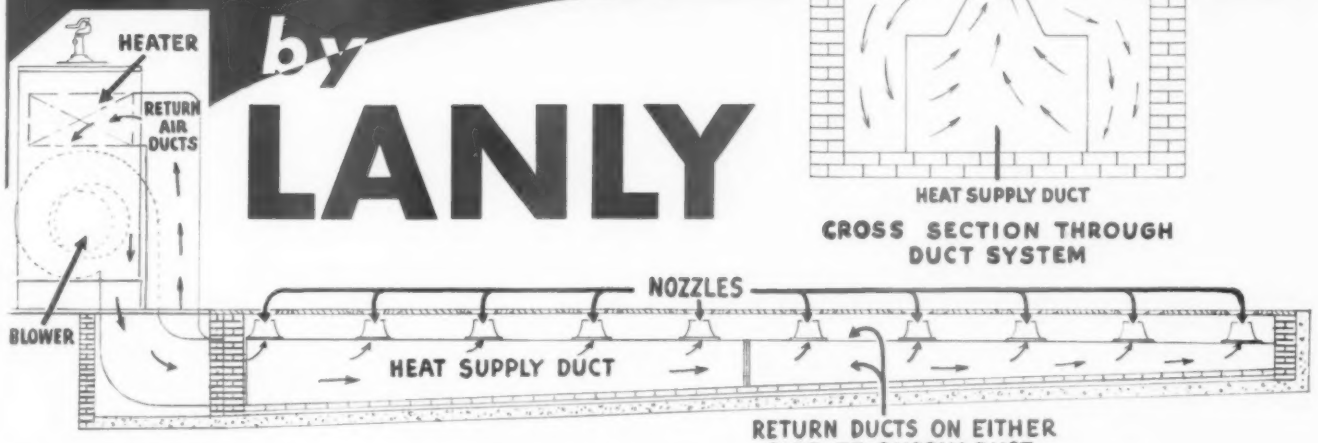
Mr. Carlson presented a colored motion picture which depicted the various steps in the manufacture of pressure cast aluminum matchplates. He said that the matchplate should be left in the mold at least 1½ hr after pouring, and preferably 4 to 5 hr. For the asbestos disk material placed between reservoir and mold sprue, it is advisable to secure the grade known as 500°-proof unless a large quantity of metal is to be placed in the reservoir.

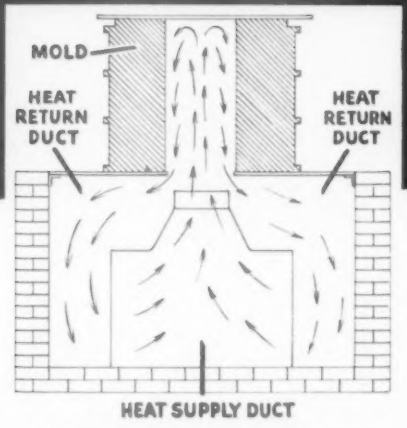
Second technical session was the Luman S. Brown Lecture, at which E. H. Ballard, Lynn, Mass., presided. Ralph L. Lee, General Motors Corp., Detroit, spoke on "Humanics in the Foundry," and pointed out that a leader of men is one who thinks that every job is important, and fights for his men. He also recognizes that the men in his employ are fellow beings. In discussions of work problems he

(*Continued on page* 176)

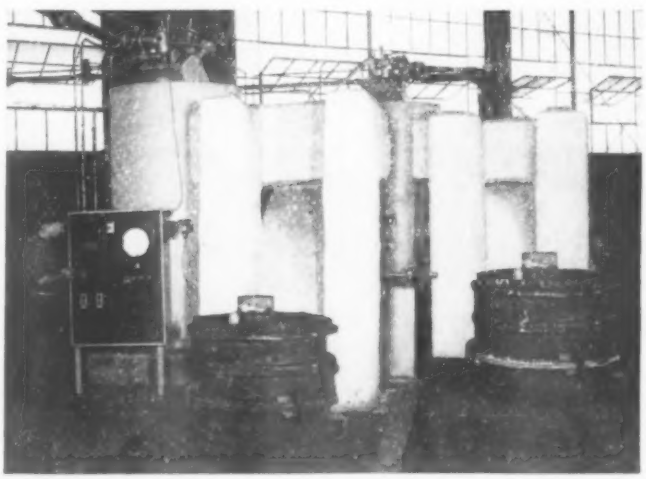


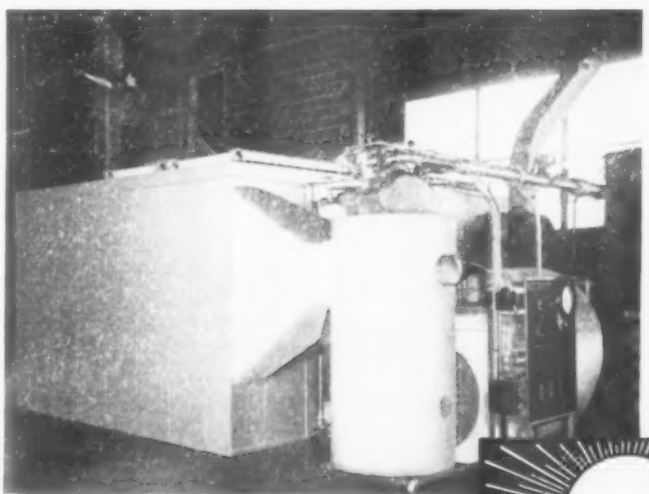
UNUSUAL INSTALLATIONS for UNCOMMON OPERATIONS by LANLY





CROSS SECTION THROUGH DUCT SYSTEM





These three installations for the Shenango-Penn Mold Co. give further evidence of LANLY competence as oven builders.

At the left are two mold drying benches. As illustrated above, heat is supplied through a main duct in an under floor tunnel. The heat passes through nozzles into molds placed on the metal floor directly above. Plates on top of the molds divert the heat downward into ducts which return it to the heater for reheating and recirculation.

The result is a smooth working, economical installation.

The oven illustrated at the lower left has sliding doors on top through which unusually long cores are lowered by an overhead crane.

All three systems are heated by Lanly versatile and highly efficient convection heaters.

Literature is available describing LANLY standard ovens. Correspondence is invited regarding ovens for special purposes.

THE LANLY CO.
INDUSTRIAL OVENS
780 PROSPECT AVENUE · CLEVELAND 15, OHIO

AROUND Detroit

Chrysler plans small foundry for production of cast iron camshafts. . . . Problem of absenteeism in foundries partly relieved by declining demand for replacement parts castings

By A. H. ALLEN
Detroit Editor
THE FOUNDRY

DETERMINED not to get caught again "with its camshafts down," Chrysler through its Dodge Division has launched plans for a small electric furnace foundry for production of flame-hardened cast iron camshafts. It will be recalled the recent protracted shutdown of the supplier of these camshafts seriously depleted supplies of shafts from that source and, in fact, virtually exhausted everything Chrysler had, forcing the company to divert replacement parts to production, re-route Canadian stocks to the U. S., start up limited operations on forging steel shafts and make other emergency moves. Only because of a shutdown enforced by a strike at Briggs Mfg. Co., which interrupted body shipments, was Chrysler able to avoid going down from lack of camshafts. Shipments now are back to or above normal but Chrysler is taking out a little insurance against another such close shave.

Set Up Pilot Line

From reports in the trade, Dodge at first will set up a sort of pilot line, with an electric furnace, a couple of molding machines, flame-hardening equipment, etc., to get the process working smoothly. However, a small building near the present Dodge main plant has been taken over and eventually, it is understood, will be outfitted for a production setup on camshaft castings. As yet no information is available on probable output rate or detailed equipment requirements. Inquiries have been received for molding machines and various foundry supplies required for the pilot installation.

For many years there have been reports of Chrysler moving its Dodge foundry out of the Hamtramck location where it is entirely surrounded by a densely populated area of Detroit and where the problem of getting many thousands to and away from their jobs is rather congested, to say the least. Marysville, Mich., has been mentioned as a possible location for any such decentralizing move. For the present, it appears, the plan is either dead or dormant, since the Dodge foundry has been given a modernizing treatment to the tune of several million dollars and continues to operate at full tilt.

Principal changes were confined to the coreroom which was moved from the second floor of the six-story building to the fifth and sixth floors, with all core ovens now located in a new structure erected on the roof of the building. This was calculated to eliminate heat and fumes from the building proper and to give a better flow of material from coremaking to storage. Cores are now stored on the second floor. A considerable saving also was effected by arranging cooling tunnels through which cores pass from ovens, so they can now be handled at room temperature after baking instead of while still hot.

The Dodge foundry has long had a reputation for its exceptionally low scrap losses and while they have increased slightly postwar in view of erratic qualities of raw materials, they are still probably well below average. One explanation, of course, is that the foundry concentrates on the "cream" of castings required in Chrysler products-blocks, heads, flywheels, and transmission cases-while other cast iron parts are farmed out, letting foundry vendors worry about scrap losses in these items. One fairly large castings plant, located outside of Michigan, is reported to be wholly owned by Chrysler and now in process of expansion and modernization; officially the company will have nothing to say on this project, despite the fact the connection is known throughout most of the trade.

* * *

ABSENTEEISM continues to be a perplexing problem in most of the large motor plants, particularly in foundry divisions. On Mondays, for example, absenteeism will be double or triple the weekly average and, despite high wages, there is apparently nothing management can do to persuade working forces to finish their week-end relaxing on Sunday nights. Occasionally chronic offenders will be laid off for a couple of weeks as punishment—with union approval, incidentally—but this appears to have little effect. The guilty ones seem glad to have the vacation and saunter back to work about as they please.

The condition is symptomatic of a disease which afflicts a great cross section of the American working force—and not only at the plant level but on up into higher echelons as well — of not being too much interested in working regularly and on time, much less working hard when on the job. Possibly the results of the election confirm the point. Initiative and drive are lacking among working people; if troubles develop, the government will provide any needed assistance, tney are convinced. Hence the distrust of anyone who believes in efficiency and hard work and systematized operations; it is more pleasant to eat the old "pap" of all-embracing social security and relax. Obviously the happy days will not last forever and what happens then is anybody's guess.

They All Go A-Hunting

The annual pheasant and deer hunting seasons, as usual, found thousands of foundry workers, along with their brethren in other departments, either insisting on time off or taking the time off anyway. At one upstate foundry, union representatives approached the management with the customary demands for the deer-hunting intermission and found their employers strangely acquiescent. Schedules would be trimmed for a couple of weeks and the men could go chase all the deer they pleased. What the union did not know when it presented the demands was that new orders had fallen off to the point where a downward adjustment of production was necessary anyway, so the vacationing foundry workers were wondering whether reduced work weeks may now become regular things, with a consequent trimming of take-home pay. To take time off for deer hunting is one thing, but to be forced into idleness by lack of business is something else.

The situation is not peculiar to this one plant, as several instances are reported where castings business has

(*Concluded on page* 122)

"O.K. So You Pre-compress the Springs---Then What Happens?"

This fellow may sound a bit skeptical about Spring-Mounted Roller Conveyer, but that's not exactly so. Like other men who work with Foundry Conveyers, he knows that Roller Conveyer applied in this industry must have extra weight and strength built into it. He has seen a lot of too-light conveying equipment beaten to pieces in a short time under severe foundry service. That is why he is interested in Spring-Mounted construction. He is learning that when springs are pre-compressed to normal roller capacity, the load does not *bounce*, and the conveying surface is *smooth* and *even*. When the rollers are overloaded, the *springs* rather than the *bearings* of the rollers absorb the shock. Spring-Mounted Roller Conveyer is a Mathews development to meet the requirements of heavy industry for Roller Conveyer which will operate under severe conditions with a minimum of maintenance attention and expense, and it is establishing quite a reputation for itself by doing just that.

MATHEWS CONVEYER COMPANY
ELLWOOD CITY, PENNSYLVANIA

MATHEWS CONVEYER COMPANY WEST COAST
SAN CARLOS, CALIFORNIA

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Engineering Offices or Sales Agencies in Principal American and Canadian Cities

(*Concluded from page* 120)

slumped in recent weeks, particularly in the replacement parts field, both automotive and refrigeration. At the recent annual meeting of the automotive parts association in Detroit estimates indicated manufacturers business had fallen off 30 per cent in the past year. The drop is not too serious, since replacement parts production has been at a record all-time peak. The point simply is that the trend is down for a change.

* * *

SCARCELY any easing has been noted in an extremely tight pig iron supply situation, merchant sources being hard pressed even to come close to demand and steelmakers understandably diverting the highest possible proportion of their blast furnace output to open hearths in view of the abnormally high cost of steelmaking scrap. A $10-per-ton decline in open-hearth scrap price could reverse this picture and release more pig iron for the foundry trade, since steel plants might economically switch furnaces on steelmaking iron to foundry iron. Another factor which would step up pig iron availability is an improvement in coke quality, in turn dependent upon better grades of coking coal. Even as little as a 5 per cent gain in quality of coke would boost pig iron output importantly and inevitably make more tonnage for foundries. Encouraging signs are noted of improvement on quality of coal coming from the mines.

What concerns most large melters is that last few hundred tons necessary to balance out melting schedules. If a foundry is scheduled to melt, say 500 tons of pig iron a day, and shipments are only 475 tons a day, it is that difference of 25 tons which causes the headaches and makes it necessary to buy fill-in tonnages of foreign iron, or pig from Utah or Texas, or pay the premium for iron from the new Lake Iron Co. which is shipping into this territory from the Wickwire-Spencer stack in Buffalo.

Similarly, the auto plants requiring specified tonnages of flat-rolled steel to meet production schedules and falling short by a narrow margin are forced into the conversion market and buy ingots from electric furnace plants or steel foundries now reaping a lucrative harvest from this business. Cost of such steel is usually more than double the mill price on similar material, but the extra cost of fill-in tonnage is offset against a complete schedule and the increase per unit of production is tempered somewhat. Detroit Steel Casting Co. is understood to have suspended temporarily the production of castings, meawhile devoting its facilities to making conversion ingot.

ALLOY CASTINGS DISCUSSED

At National Metal Congress

AT the recent thirtieth annual National Metal Congress & Exposition held at Philadelphia on Oct. 23 to 29, several papers of direct interest to foundrymen were presented at meetings of the American Society for Metals.

One related to "Microstructure and Mechanical Properties of Cast Steels" by M. F. Hawkes and B. F. Brown, Carnegie Institute of Technology, Pittsburgh, in which a study of a large number of plain and alloy steels after various annealing and normalizing treatments showed the following: In any one cast steel successively better ratios of ductility to strength are obtained as faster and faster cooling rates are used. Types of microstructure occur in the following progression—dendritic blocky ferrite plus pearlite; random blocky ferrite plus pearlite; Widmanstaetten ferrite plus pearlite, and martensite. Maximum ductility is gained by quenching to martensite and tempering at a high temperature.

A paper by N. A. Ziegler, W. L. Meinhart, and J. R. Goldsmith, Crane Co., Chicago, reported on the "Effect of Vanadium on the Properties of Cast Carbon and Carbon-Molybdenum Steels," and indicated that thermal sluggishness was increased by the combined effects of C, Mo and V, but not V alone in the carbon steel group. Increasing V contents reduced pearlite grain size and produced some extremely fine spheroidal carbides. Vanadium moderately increases tensile strength, yield point, proportional limit and hardness, slightly reduces ductility and to a considerable extent reduces impact resistance. Metal arc welding of steels presented no difficulties with regard to cracks and voids.

Carl A. Zappfe and R. L. Phebus, Baltimore, discussed the "Cause and Cure of Inverse Chill and Hard Spots in Cast Iron," and came to the conclusion that hydrogen segregations within the body of the iron are responsible for the phenomenon. According to the authors moisture is the principal source of hydrogen, and the cure obviously is control of the moisture content coming in contact with the iron. Use of absolutely dry ladles will help, as will flushing with a hydrogen-free gas such as nitrogen.

In another paper A. G. Guy, North Carolina State College, Raleigh, N. C., described a group of cast nickel-base alloys having superior rupture strength at 1500° F. They contain 64 to 72 per cent Ni, 5.5 to 7 per cent Al, 5 to 15 per cent Mo, 5 to 15 per cent Cr, 0.5 per cent B, 4.5 per cent Fe, and 2 per cent Cb. In a few rupture tests run at 1700° F oxidation resistance of the alloys was good, and the 100-hr rupture strength was in the 15,000 to 20,000 psi range.

One of the features of the National Metal Congress was the "Salute to Alloy Steel" in celebration of the 75th anniversary of the first use of alloy steel in the Eads bridge over the Mississippi river at St. Louis. Announcement of distinguished service awards to 75 individuals who have made outstanding contributions to the progress and development of alloy steels was made by Francis B. Foley, out-going president of ASM at the annual banquet. The following men well known in the foundry field were included: A. L. Boegehold, General Motors Corp., Detroit; Hyman Bornstein, Deere & Co., Moline, Ill.; H. J. French, International Nickel Co. Inc., New York; H. W. Gillett, Battelle Memorial Institute, Columbus, O.; Fred Loosely, Dominion Foundries & Steel Co., Hamilton, Ont.; C. F. Pascoe, Canadian Car & Foundry Co., Montreal, Que.; Jerome Strauss, Vanadium Corp. of America, New York, and W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.

Harold K. Work, Jones & Laughlin Steel Corp., Pittsburgh, was elected president of ASM, and Arthur E. Focke, Diamond Chain Co. Inc., Indianapolis, was elected vice president. New members of the board of trustees are F. J. Robbins, Plomb Tool Co., Los Angeles, and H. P. Croft, Chase Brass & Copper Co., Cleveland.

Anniversary Booklet

H. P. Deuscher Co., Seventh & Hanover Sts., Hamilton, O., in commemoration of its 70th anniversary, has published a booklet which tells something about Deuscher's history, describes some of the things produced in the foundry and attempts to explain the importance of the gray iron castings industry as a whole.

There's green strength for you

TRUSCOR (light weight) or AMERIKOR (heavy weight) Cereal Binder added to the core sand mix does a lot for core quality. It increases the affinity between individual sand grains before baking. This means greater green strength . . . more accurate cores.

The same qualities that bond sand grains together, prevent their adhering to the pattern, resulting in sharper — cleaner cores, thus better castings. Moreover, finely divided cereal binder adds a definite character to the mixture for a better surface finish.

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to cut melting costs and speed foundry production

These facts as charted, concerning CARBOFRAX silicon carbide linings, present a series of related advantages. One saving leads to another. The cumulative effects of these advantages make an investigation of CARBOFRAX linings worth while.

General information will be sent you upon receipt of your written request to Dept. B-128. Specific details pertaining to your installations may be obtained through a personal discussion with one of our engineers. The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.

		SPEED PRODUCTION	CUT COSTS
1	**CARBOFRAX linings last longer.** They have high refractoriness . . . strong resistance to spalling, cracking and flame erosion.	Because they last longer, CARBOFRAX tile help reduce the amount of "down time" necessary for relining or frequent patching.	Because there are more melts from each lining, costs per ton of metal melted are lower.
2	**CARBOFRAX linings improve melting efficiency.** These tiles are only 1¾ inches thick...allow more room for insulation...reduce heat losses.	With less heat loss—with lower heat capacity structure, melting is accomplished quicker, permitting more melts per shift . . . higher production per year.	With more melts from each shift, production costs are lower, profit margins higher.
3	**CARBOFRAX tile install easier and quicker.** Even with unskilled labor, these uniformly sized tiles, with interlocking joints, can be set in place in a fraction of the time usually required.	Faster relining reduces unproductive "down time" gets furnace back into profitable production in a hurry.	With lower maintenance and repair costs resulting from faster relining and use of unskilled labor, costs of furnace operation are lowered.
4	**CARBOFRAX linings improve Crucible life.** Heat is radiated uniformly to Crucible as lining retains original contour longer—does not cut and wear back rapidly.	Maintaining a constant melting rate, you get more melts per shift, more furnace output per year.	Higher melting efficiency means lower fuel input. Add this to lower labor costs, lower maintenance expense, and you can see why foundries prefer CARBOFRAX linings for all-around economy.

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by CARBORUNDUM

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FOUNDRY Developments

By EDWIN BREMER

FOUNDRY in the Middle West has eliminated trouble often encountered in filling ladles at the cupola spout. Instead of permitting the metal to flow off the end of the spout, a vertical hole is made near the end, and the latter closed off. As a consequence the molten iron drops straight down in the same place every time, no matter what the pressure head on the metal stream.

* * *

NEW laboratory for the study of automotive engine performance has been installed at the National Bureau of Standards under the direction of A. R. Pierce. Equipped with completely automatic controls, this laboratory offers a means of closely simulating actual operating conditions in such a way that tests can be reliably duplicated. While designed primarily for investigations of cylinder wear, the new equipment also may be used in studying the effects of various types of fuels and lubricating oils on pistons, piston rings, bearings and carburetors.

* * *

NONFERROUS foundrymen seem to be overlooking a bet that steel foundrymen in particular and gray iron founders to a lesser degree have found of considerable advantage in securing sound castings. That is the use of plain and exothermic insulating compounds on risers and gates of castings. Those materials delay the freezing of metals and alloys to a considerable extent, and permit a much longer feeding period than is the case when the risers and gates are exposed to atmospheric conditions.

* * *

ALMOST every one has heard of the wisdom of King Solomon and his just decisions, and undoubtedly will be interested in the following remarks by E. C. Bain, Carnegie-Illinois Steel Corp., in a speech some time ago: "There is an old apocryphal legend, I believe, which sets forth that King Solomon somehow failed to invite his master ironworker to the great celebration of the completion of his Temple. Uninvited, the iron master, the maker of tools, came to the banquet anyway and chose the seat of highest honor much to the perturbation of some of the guests. 'How is it', said they, 'that this obscure fellow presumes to set himself up among the artisans of the Temple', and they fain would have him cast out. Whereupon Solomon, being informed of the altercation, considered for a moment and held that the iron master was rightly entitled to the seat of honor, since without his skill the other chief artisans could scarcely have wrought at all."

* * *

OPTIMUM properties for 8 to 10 per cent nickel steel intended for service at —320° F according to a paper presented at the annual meeting of ASM by G. R. Brophy and A. J. Miller, are obtained by double normalizing followed by reheating. Preferred treatment is normalize at 1650° F; renormalize at 1450° F; reheat at 1050 to 1075° F, and finally reheat to 800 to 900° F for stress relief.

* * *

SATISFACTORY process for brazing magnesium recently was announced by Dow Chemical Co., Midland, Mich. Commonly used brazing methods of furnace, flux dip and torch are applicable to magnesium. A flux must be present to free surfaces from oxide or other films to permit capillary flow. Because the brazing process depends on capillary flow, especially in furnace and dip methods, it requires careful design of joints with proper clearance (0.004 to 0.010-in.) and proper placement of filler metal. Magnesium brazing temperatures are between 1075 and 1160° F. Brazing of Dowmetal M alloy is on a commercial basis but brazing for other alloys is in experimental stage.

* * *

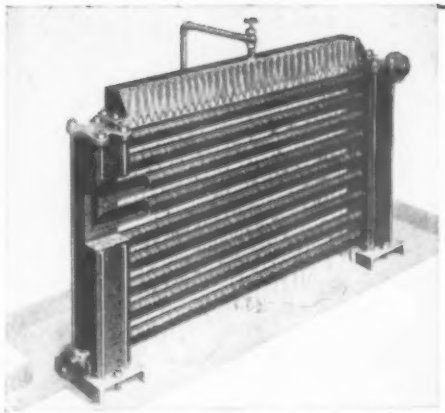
WHILE ductile titanium metal has been available in small quantities for research purposes, it now is being produced at the rate of 100 lb daily in a pilot plant at the Newport, Del. plant of the DuPont Co. While considerable is known on the properties of ductile titanium such as its density 0.163 lb per cu in., that it possesses a high resistance to corrosion, and a high proportional limit, more work now can be done to determine its commercial possibilities. For example, its density while 63 per cent greater than aluminum is 56 per cent less than that of stainless steel. Hence, with its corrosion resistance it combines the properties of strong aluminum alloys and stainless steels with the added advantage of having a proportional limit of nearly three times that of stainless steel.

* * *

A MIDWESTERN gray iron foundry has reduced ladle lining problems to a minimum in the small hand-pouring type by using square shells instead of round. That permits employment of standard split firebrick with a uniform joint line all around without necessity of trimming to make a good fit.

* * *

CRITERIA for obtaining the best mechanical properties in any one heat of steel, according to M. F. Hawkes and B. F. Brown in a paper presented at the recent annual meeting of ASM, are: Better ratios of ductility to strength are obtained as faster and faster cooling rates are used. This leads to the formation of different types of microstructures in the following progression: Dendritic blocky ferrite plus pearlite; random blocky ferrite plus pearlite; Widmansaetten ferrite plus pearlite, and martensite. Maximum ductility obtainable in a cast steel is obtained by quenching the steel to martensite and then tempering at a high temperature. Little or no loss in ductility and appreciable gain in strength are obtained by moderately rapid cooling (in air), which forms Widmanstaetten ferrite, in place of slow cooling, which forms blocky ferrite.



"Karbate" Sectional Cascade Cooler

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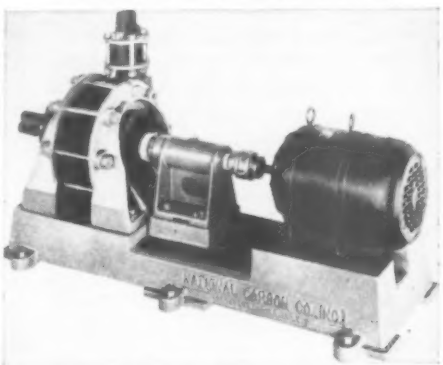
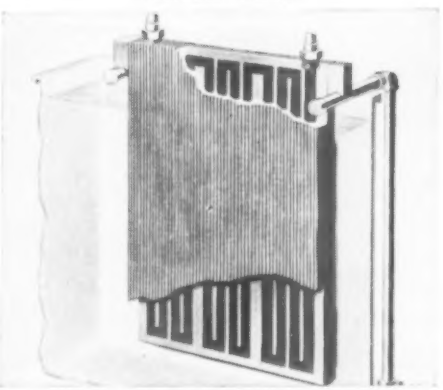
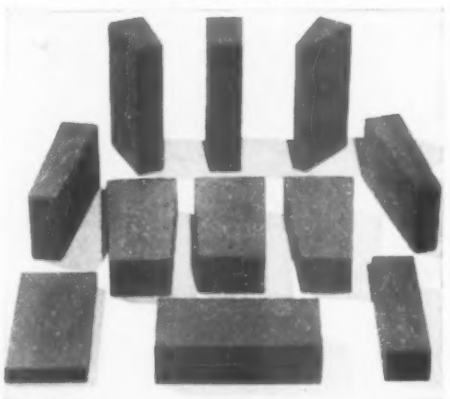


"Karbate" Pump



"Karbate" Plate Heater



Carbon Brick for Tank Lining

How to lick corrosion if you pickle or plate metal . . .

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FOR HEATING, cooling, pumping, and conveying the corrosive solutions used in pickling and plating metal, there's no better equipment than that made of "Karbate" brand Impervious Graphite. This material is chemically inert, immune to thermal shock, easy to machine and install, light in weight yet strong; and has a very high heat-transfer rate.

Operating experience has proved that "Karbate" equipment stands up in sulphuric, hydrochloric, and nitric-hydrofluoric pickling solutions . . . Parkerizing and Bonderizing baths . . . nickel, copper, tin, and zinc plating solutions . . . electro-polishing and Alumilite and Alzak processes.

"National" carbon brick is now extensively used for lining tanks that handle corrosive solutions – particularly nitric-hydrofluoric.

For more details on metal-cleaning systems of standard "Karbate" brand Impervious Graphite units and "National" carbon brick, write to National Carbon Company, Inc., Dept. FO.

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CANADIAN FOUNDRYMEN MEET IN MONTREAL

For Second All-Canadian Foundry Conference

THE second All - Canadian Foundry Conference, held at the Windsor Hotel, Montreal, Sept. 30-Oct. 1 with a registration of 275, brought representatives from all over the Dominion with the exception of western Ontario and British Columbia. At the opening luncheon the visitors were welcomed by Chapter Chairman O. L. Voisard, Robert Mitchell Co. Ltd., St. Laurent. A representative of the city council on behalf of Mayor Houde presented greetings from the city of Montreal.

Prominent ferrous and nonferrous foundries which were thrown open for plant visitation the two days included Crane Ltd., St. Patrick Street bronze foundry, and Crane Ltd., malleable foundry; Canadian National Railways (Pointe St. Charles shops); Canadian Car & Foundry Co. Ltd.; Dominion Engineering Works Ltd.; Jenkins Bros. Ltd.; Robert Mitchell Co. Ltd.; Montreal Bronze Ltd.; and Warden King Ltd.

"Dust Control in the Foundry" was the subject of the first technical paper Thursday night. This paper was presented and discussed by Allen D. Brandt, industrial hygiene engineer, Bethlehem Steel Co., Bethlehem, Pa. In his introduction the speaker admitted that a great deal of progress had been made during the past decade in the control of foundry dust, but it is still far from perfect. In the speaker's opinion some of the responsibility for failure must rest with the foundry superintendent who believes that the only way to clean up a foundry is to burn it up or shut it down.

The speaker divided his subject and presented it under the five following heads: 1—Preparation of molds and cores. 2—Melting and pouring metal. 3—Shakeout of castings. 4—Cleaning of castings. 5—Reconditioning of sand.

By way of entertainment and general information on a subject about which the public knows little or nothing, a film entitled "River of Paper" was shown through the courtesy of G. Harold Fisk, Montreal agent, Powell River Co., Ltd.

On Friday afternoon three technical sessions were carried on simultaneously dealing with gray iron, steel and nonferrous metals. Two papers featured the steel group meeting under the joint chairmanship of H. H. Fairfield, Wm. Kennedy & Sons Ltd., Owen Sound, Ont. and C. V. Hacker, Lynn McLeod Metallurgy Ltd., Thetford Mines, Quebec. Truney Shute, Canadian Car & Foundry Co. Ltd., Montreal, led the discussion on "Steel Molding Sands and Binders." V. E. Zang, Unitcast Corp., Sherbrooke, Que., and Toledo, O., delivered an address on general steel foundry practice.

(*Continued on page* 130)

(Above)—Speakers' table at dinner concluding the All-Canadian Conference in Montreal. (Right)—Allen D. Brandt, Bethlehem Steel Co., addressing the conference on the subject of dust control. (Below)—Group of conference visitors leaving the hotel for visits to various Montreal foundries

Products for the Iron and Steel Industries

PRODUCT	TYPICAL COMPOSITION	APPLICATIONS
ALSIFER	Aluminum.....20% Silicon.....40% Iron.....40%	Used principally as a steel deoxidizer and for grain size control.
FERRO CHROMIUM High Carbon Grade	Chromium....66-70% Carbon.....4-6%	For wrought constructional steels and steel and iron castings.
Iron Foundry Grade	Chromium....62-66% Carbon.....4-6% Silicon.....6-9%	For alloyed cast irons. Readily soluble as a ladle addition at the lower temperatures of cast iron.
Low Carbon Grades	Chromium....67-72% Carbon...06%, .10%, .15%, .20%, .50%, 1.00% and 2.00% max.	For low carbon chromium steels, especially those with high chromium content, such as stainless and heat-resistant types.
FERRO SILICON 25-30% Grade	Silicon.....25-30%	Deoxidizer for open hearth steels; also for high silicon, corrosion-resistant iron castings.
50% Grade	Silicon.....47-52%	Used as a deoxidizer and for the addition of silicon to high silicon steels, for springs, electrical sheets, etc. Pulverized form used as ladle addition to cast irons for silicon content and graphitization control.
75% Grade	Silicon.....74-79%	For high content silicon steels, such as spring steels, sheets and forgings of high magnetic qualities for electrical apparatus.
High Silicon Grades 80-85% 85-90% 90-95%	 Silicon.....80-84.9% Silicon.....85-89.9% Silicon.....90-95%	For high content silicon steels where small ladle additions are used for required silicon content. Also for manufacture of hydrogen by reaction with caustic soda and production of magnesium by the Pidgeon process.
FERRO TITANIUM High Carbon Grade	Titanium.....15-18% Carbon.....6-8%	Final ladle addition to control "rimming" action and to clean effervescing steel. Final deoxidizer and scavenger for steel castings and fully killed ingot steels.
Medium Carbon Grade	Titanium.....17-21% Carbon.....3-4.50%	Often preferred to the High Carbon Grade as a final ladle addition to very low carbon rimming or effervescing steels.
Low Carbon Grades 20-25% Ti Grade	Titanium.....20-25% Carbon...max. 0.10% Silicon.....max. 4% Aluminum max. 3.50%	Carbide stabilizer in high chromium corrosion-resistant steels of extremely low aluminum content. Deoxidizer for some casting and forging steels.
40% Ti Grade	Titanium.....38-43% Carbon...max. 0.10% Silicon.....max. 4% Aluminum...max. 8%	Carbide stabilizer in high chromium corrosion-resistant steels, where smaller ladle additions are desired and extremely low aluminum content is not essential.
VANADIUM METAL 90% Grade	Vanadium....91.15% Aluminum.....2.25% Silicon.....0.50% Carbon.....0.17%	For special iron-free (nonferrous) or low iron alloys or low impurity ferrous alloys.
95% Grade	Vanadium....95.18% Aluminum.....2.00% Silicon.....0.27% Carbon.....0.40%	Principally for research on the properties of pure alloys, where very low iron content is essential.

PRODUCT	TYPICAL COMPOSITION	APPLICATIONS
FERRO VANADIUM Grade "A" (Open Hearth)	Vanadium....35-40% 50-55% Silicon.....max. 12% Carbon...max. 3.50%	For low percentage vanadium content of rolled, forged or cast constructional steels. Also used in vanadium cast irons.
Grade "B" (Crucible)	Vanadium....35-45% 50-55% Silicon...max. 3.50% Carbon...max. 0.50%	For tool steels and special steels containing high percentages of vanadium, in which required limits for carbon and silicon are narrow.
Grade "C" (Primos)	Vanadium....35-45% 50-55% 60-65% 70-80% Silicon...max. 1.25% Carbon...max. 0.20%	For tool steels and special steels requiring high percentages of vanadium and exceptionally low carbon and silicon content.
VANADIUM PENTOXIDE Technical Grade Fused Form	V_2O_5.....90%	A source of vanadium in basic electric furnace steels. A base for numerous chemical compounds.
Technical Grade Air Dried Form	V_2O_5..... 83-85%	A base for preparation of numerous chemical compounds (catalysts, etc.).
GRAINAL ALLOYS Vanadium Grainal No. 1	Vanadium....25.00% Aluminum....10.00% Titanium.....15.00% Boron.....0.20%	Practical and economical intensifiers for controlling and increasing the capacity of steels to harden, and for improving other important engineering and physical properties.
Vanadium Grainal No. 6	Vanadium....13.00% Aluminum....12.00% Titanium.....20.00% Boron.....0.20%	See above.
Grainal No. 79	Aluminum....13.00% Titanium.....20.00% Zirconium.....4.00% Manganese....8.00% Boron.....0.50% Silicon.....5.00%	See above.
GRAPHIDOX No. 4	Silicon.....42-46% Titanium.....9-11% Calcium.....5-7%	For graphitization of iron; ladle treatment insures normal graphite, free from dendritic structure; reduces chill; efficient inoculant in production of high strength irons.
V-FOUNDRY ALLOYS V-5 Grade	Chromium....38-42% Silicon.....17-19% Manganese....8-11%	Used in cast irons as a ladle addition. Reduces chill, promotes uniformity of structure, increases strength and hardness.
V-7 Grade	Chromium....28-32% Silicon.....15-21% Manganese...14-16%	See above.
BRIQUETTES Ferro Chromium	Hexagonal. Weigh approx. 3¾ lb. and contain 2 lb. of chromium.	A practical and convenient form for adding ferro-alloys to the cupola.
Ferro Silicon	Two sizes, both cylindrical, one containing 1 lb. of silicon; the other, 2 lb. of silicon.	See above.
MISCELLANEOUS	Special ferro-alloys, metals, chemicals and carbides.	To meet individual requirements.

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(*Continued from page* 128)

Claiming there is no set pattern to describe the properties and behaviors of steel molding sands and binders, Mr. Shute offered suggestions for more satisfactory evaluation of these materials. In the steel molding sands important features include grain size, distribution, grain type and composition. For binders, all properties boil down to toughness, a combination of strength and ductility. Binders may be divided into three groups: (a)—inorganic binders; (b)—organic binders; (c) potential binders. Factors to be considered in preparing steel molding sand include: Milling cycle, moisture, ramming, permeability, size of casting, shape of casting, gating, pouring temperature, metal analysis, coating or wash, time factors, age of mold, age of metal, etc. In the discussion period animated discussion was directed toward sand and metal penetration.

Mr. Zang's remarks were confined to his firm's practice in the production of small steel castings. Sand control involves a check on every batch of facing sand and determinations on heap sand in the bins. The speaker considered that bottom-pour ladles are excellent for transfer of metal to large molds but felt they had no place in a foundry producing large quantities of small castings.

At the gray iron session, presided over by C. Johnston, E. Long Ltd., Orillia, Ont., and J. Grieve, Dominion Engineering Works, Montreal, I. C. Sheppard, Beach Foundry Ltd., Ottawa, presented a paper on modernization in the foundry. "Notes on Cupola Melting" was presented by E. C. Winsborrow, Shawinigan Foundries Ltd.

Mr. Sheppard referred to the technical advances of large plants during the war period, advances that have served as patterns for smaller plants. In his opinion the forecast for the future of cast iron production is optimistic. Production should hold its own, and more, during the next few years. The speaker touched on what is becoming a serious problem in the foundry, the necessity of training apprentices. More determined effort should be made to attract boys to the foundry. Price is the last consideration. The proper basis is a price for each casting, based on cost plus a charge for service, selling and profit.

In some notes on cupola melting E. C. Winsborrow stated that many foundrymen noted the abstract and passive nature of much that had been written on the subject. They were perplexed by what some writers describe as the imponderables of cupola practice. He described in detail heat development and heat transfer within the cupola. Important factors which affect the efficiency of heat transfer include: Coke size, size of metal pieces in charge, velocity of cupola gases, clearly related in part at least to the first two factors; proper air distribution by properly designed and number of tuyeres; for-

(*Concluded on page* 156)

(Left above)—J. C. Converse, Crane Ltd., speaking at the nonferrous session. At left is Harold J. Roast, at right J. Dalby, Wilson Brass & Aluminum Foundries Ltd., Toronto. (Center)—Registration desk at the conference. (Below)—Audience at the opening session is shown below

PALMER-BEE POINTS THE WAY

WITH DEPENDABLE CORE OVEN CONVEYORS

● Illustrated above is a Palmer-Bee Horizontal Core Oven Conveyor. Over 80,000 feet of this design have been installed in foundries in this and foreign countries. Core racks suspended from single trolleys carry a core load in excess of 3,000 pounds. The chain and trolley attachments are made from alloy drop forged steel and are heat-treated. The 6″ dia. trolley wheels, Timken equipped, insure chain operation without jerk or pulsation. Foundry Engineers who know the exacting requirements to be met with core baking conveyors, insist on the Palmer-Bee design for dependability and smooth running through the core collecting and baking operation.

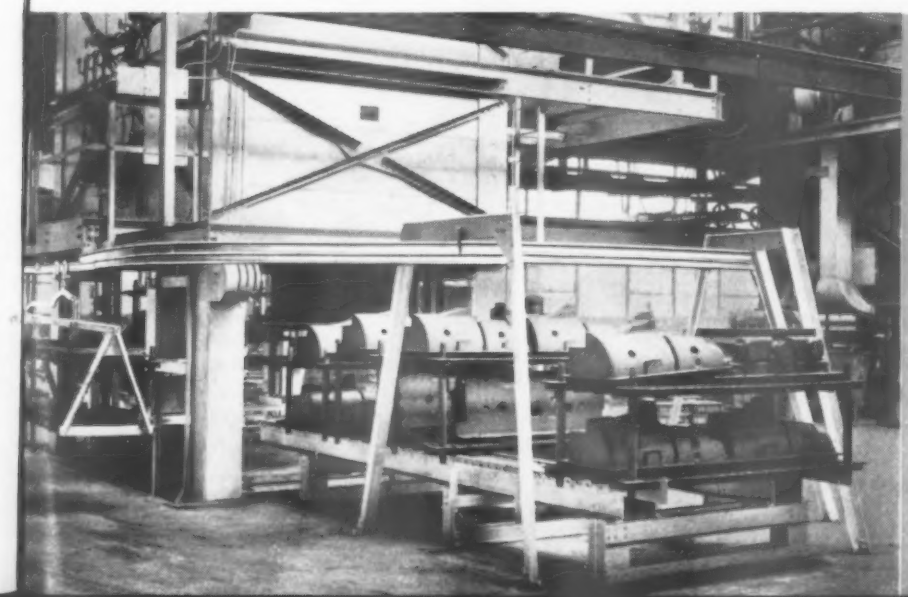
Shown below is the loading and unloading end of a Palmer-Bee Vertical type Core Baking Conveyor. These conveyors are built in various sizes and capacities. The one shown is the largest ever built. It has a 16″ dia. head shaft, 147″ dia. chain sprockets, and carries a suspended load of 100 tons.

PALMER-BEE SPECIALIZES IN THE DESIGN AND MANUFACTURE OF BOTH HORIZONTAL AND VERTICAL CORE OVEN CONVEYORS

PALMER-BEE COMPANY

WESTMINSTER AT GRAND TRUNK RAILROAD • DETROIT 12, MICHIGAN

BRANCHES: CHICAGO • PITTSBURGH • MILWAUKEE • WINSTON-SALEM • NEW YORK CITY



Vertical core oven using 147″ dia. all steel welded sprockets, and 16″ dia. head shaft.

PALMER-BEE CO. CONVEYORS POWER MACHINERY DETROIT SPEED REDUCERS STEEL FABRICATORS ENGINEERS

Man-to-Man

ON THE MOLDER'S BENCH

"Tools and the Man"

By RALPH L. LEE

I'LL never forget the time two new toolmakers came to work in the shop where I was serving my apprenticeship. One came struggling in loaded down with a heavy tool chest in each hand—and I do mean chests—besides an extra cardboard box strapped onto one of them. The other newcomer ambled in with a little soft-leather satchel and his apron wrapped in newspaper under one arm.

Having a natural yen for fine tools, but with practically no money to buy any, I made short work of getting acquainted with the well supplied newcomer and an opportunity to see what the heck he had in the chests. I remember that it didn't take much coaxing to get him to open up—he willingly showed me the works. What a display it turned out to be! One after another I fondled the tools I had drooled over when looking through the store windows. Then and there I made up my mind that I was going to save every penny I could possibly spare out of my weekly wage of $5.20.

Later I was due for a real letdown when I discovered that this completely tooled-up individual wasn't getting the top-notch jobs the other light-satcheled guy was getting. In fact, I found that this fellow with the fewest number of well worn and common ordinary tools was running circles around the other cookie when it came to real workmanship and speed.

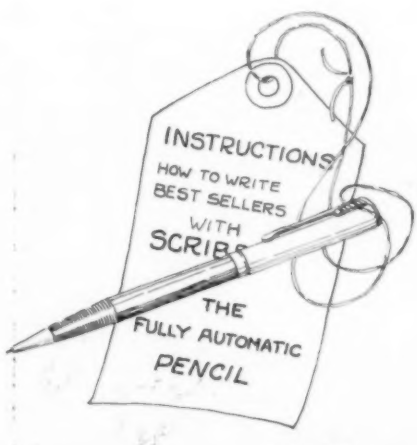
When I mentioned my surprise to my Dad he kind of smiled and said, "Well Son, tools are darned important but it sure does take the cake what different mechanics can do with the very same tools. There's always a lot of things we'd like to buy some day, in addition to what we can't get along without, but tools don't make the man by a darned sight."

I hadn't thought of these two toolmakers for years until a short time ago when an old foundry friend of mine and I were driving back from a foundry he and I had visited for the second time in a little over a year. After having run out of things to say for a mile or two Fred popped up with, "No sir!, there are *certain* things you can't buy."

"What the—who, why and where," I replied.

"All right," Fred said, "I noticed you ambling around all through the foundry back there, looking into this and that. What was your honest impression now that a year has passed since the other visit?"

"Oh I don't know, Fred," I said, "I sorta got the impression that the boys must have been making quite a little hunk of change the way they've been buying new equipment. Now you take that new sand elevator or what ever you call it—it sure has it all over hand shoveling into the hoppers. That new air compressor is a honey and the new furnace is too. The building extension on the east side there certainly gives them a lot more room. You'll certainly have to admit they were stumbling all over each other jammed in the way they were a year ago."



Ralph L. Lee

"Yep! you're right," said Fred, "and I happen to know about certain new business they're expecting to get, but the fact remains that the amount of stuff they are shipping now isn't enough more than what they were shipping a year ago to make all this new stuff they've bought a very good deal. That's why I said there are certain things you cannot buy."

"Now wait a minute, old pal, old pal—everything they've bought is good—it's new—m o d e r n and a darned sight better than the old second-hand stuff they had before. I don't see how they can help but turn out more and better castings."

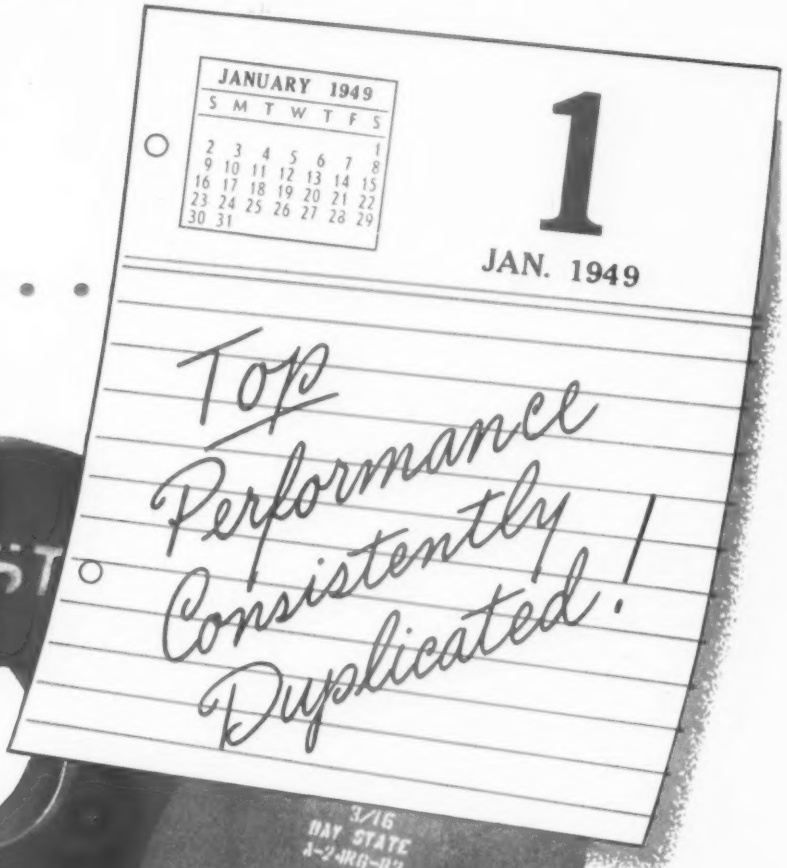
"Look Ralph, here's what I mean. In some ways buying a new piece of foundry equipment is like buying a new camera. Now if the guy buying it had really practiced taking pictures with his little old Brownie and learned to do what no camera can do for him, then in all probability the new piece of equipment he buys will multiply the results of the skill he already had. But on the other hand, if some other fellow who hasn't put in the practice and learned the art of taking pictures, thinks for one moment that the secret of the fine pictures the other fellow takes is in the camera he owns, he's kidding himself all over the lot. Again I say there are certain things you can't buy, and Ralph, sometimes I think the most important things to running a foundry are the ones you can't buy.

In a way I sort of thought that maybe Fred was making a mountain out of a molehill, but the more I thought about it the more certain I became that he really had a point. I've been in some foundries that spend a lot of time looking for the kind of new equipment that will get them out of their troubles, buying it, trying it, shelving it and then

(*Concluded on page* 134)

YEAR OUT . . .

YEAR IN . . .



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(*Concluded from page* 132)

trying something else and still not getting along so good. Then there are others I've seen that spend more time getting the hang of the stuff they've got who seem to run circles around the first group.

I guess when it's all said and done molding is still pretty much an art in spite of all the fine improvements that have been made in our tools and equipment. So far I haven't seen one single piece of fully automatic foundry equipment that will produce the same results for everyone who can manage to push a button. Until one is invented it strikes me that using the old bean on each job we get, licking each problem as we come to it, profiting from each boner, cutting out lost motion and waste, stop putting off till tomorrow, practice, more practice and still more practice are always going to remain the biggest differences between going places and getting nowhere.

This kind of pecking away at things, coupled up with the best possible equipment for the job at hand, is a combination that's hard to beat. Tools are important, but what you do with them is more important.

FOUNDRY EQUIPMENT MANUFACTURERS MEET

See Continued Active Modernization Trend

By FRANK G. STEINEBACH
Editor
THE FOUNDRY

MANUFACTURERS of foundry equipment are of the opinion that the tremendous program of foundry modernization and mechanization will continue during 1949 at about the same rate as during the current year. This expression of confidence in the further progress of the foundry industry developed during a general discussion of the equipment business by the members of the Foundry Equipment Manufacturers' Association at the thirtieth annual meeting held at the Greenbrier, White Sulphur Springs, W. Va., Oct. 14 to 16. The discussion also revealed that the shortage of steel has necessitated the payment of premium prices by equipment producers and in numerous cases has resulted in curtailment of production and delays in making deliveries of machines to foundries.

The three-day session was devoted to an excellent program which featured consideration of various problems confronting the foundry equipment industry. Product group meetings were held on Thursday, Oct. 14, and the formal program was presented on Oct. 15 and 16. The annual dinner was held Friday evening, with special entertainment provided by members and guests.

William L. Dean, president and general manager, Mathews Conveyer Co., Ellwood City, Pa., was elected president of the association, John Hellstrom, vice president, American Air Filter Co., Louisville, was named vice president, and Arthur J. Tuscany, Cleveland, was re-elected executive secretary. Three new directors are as follows: Frank W. Klatt, president, W. W. Sly Mfg. Co., Cleveland; C. V. Nass, vice president, Beardsley & Piper Co., Chicago, and Claude B. Schneible, president, Claude B. Schneible Co., Detroit. The 1949 annual meeting will be held at the Greenbrier, White Sulphur Springs, W. V., Oct. 13 to 15.

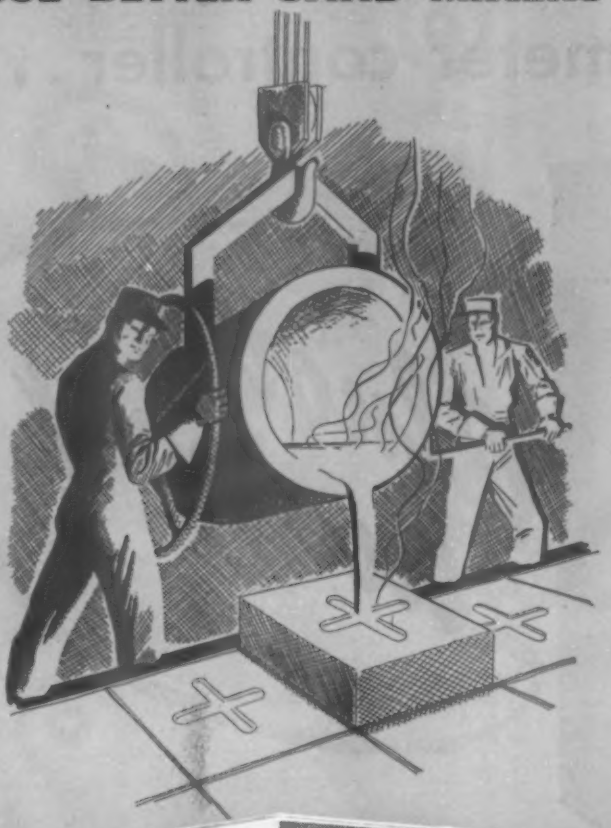
Otto A. Pfaff, president, American Wheelabrator & Equipment Corp., Mishawaka, Ind., and retiring president of the association, opened the first session with an interesting report on the progress of the organization during the past year. Membership has reached a total of 63 companies, an all-time high. During the year FEMA gave its support and active co-operation to the National Castings Council, to the organization of the Foundry Industry Advisory Committee to the Munitions Board, and to the work being done by Lee C. Wilson, as consultant to the National Security Resources Board.

In keynoting some of the management's major problems, Mr. Pfaff considered the present effects and future trends occasioned by shortages of essential materials including steel, and the problems connected with labor. While these are most serious, Mr. Pfaff believes that the major problem of equipment manufacturers is to sell its products in the volume realized in recent years. While the industry is still enjoying good equipment business, it is time to adjust thinking and activities to new conditions, if it is believed that industry is in a transitional period and gradually coming into a buyer's

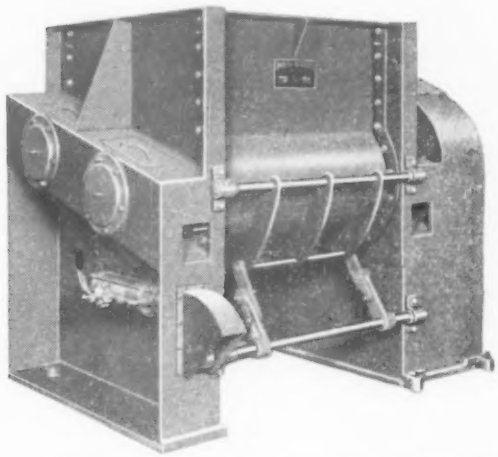
(*Continued on page* 154)

Officials of the Foundry Equipment Manufacturers Association at the recent annual meeting. Left to right: Arthur J. Tuscany, executive secretary; Otto A. Pfaff, retiring president; William L. Dean, newly elected president; John Hellstrom, newly elected vice president

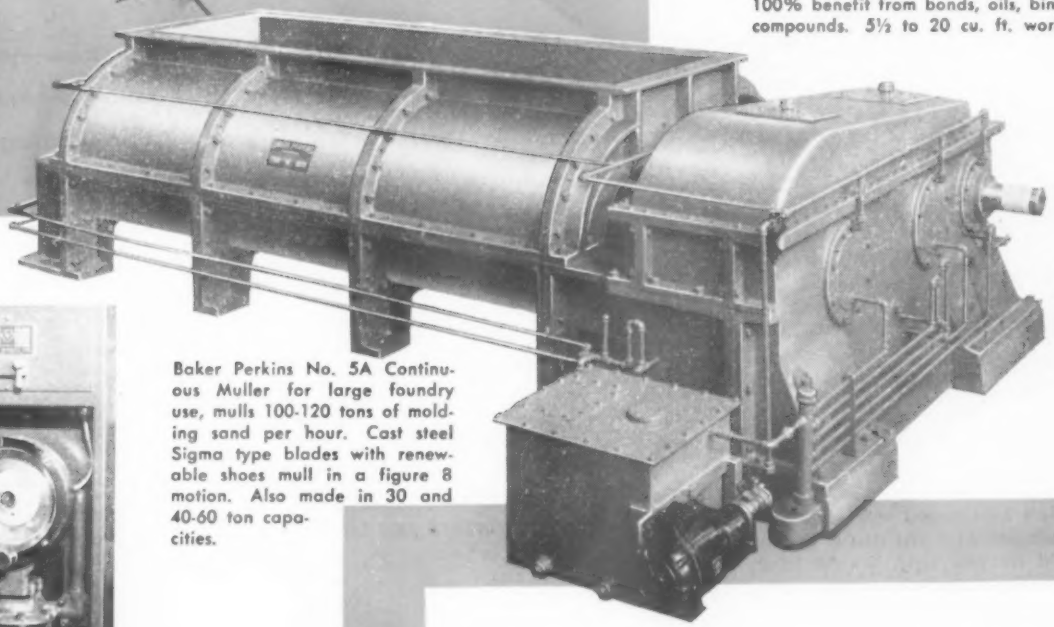
FOR BETTER CASTINGS, USE BETTER SAND MIXERS



One sure way to produce better castings is by improving your core sand. Baker Perkins foundry equipment can help you do this important job. Baker Perkins continuous mullers, batch-type core sand mixers, liquid meters, and traveling sand scales are doing an efficient job in a great many of America's most successful foundries. Any one or all of these units may be integrated into your production system to help you reduce the percentage of faulty castings and thus help increase your profits. Our engineers will be glad to study your requirements and make specific recommendations.



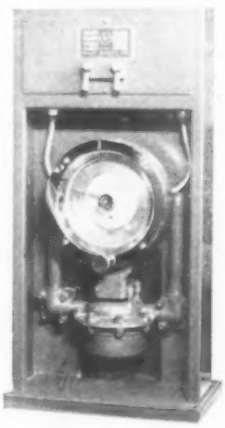
Baker Perkins "Unidor" Core Sand Mixer. Rubs, stirs, and kneads in one operation. Distributes a thin layer of bond around each grain, assuring 100% benefit from bonds, oils, binders, and other compounds. 5½ to 20 cu. ft. working capacities.



MEMBER

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

Baker Perkins No. 5A Continuous Muller for large foundry use, mulls 100-120 tons of molding sand per hour. Cast steel Sigma type blades with renewable shoes mull in a figure 8 motion. Also made in 30 and 40-60 ton capacities.



Baker Perkins Liquid Meter for accurately and automatically measuring water or binding oil flowing into each B-P Core Sand Mixer. Simple! — just dial the amount of liquid desired and the control mechanism does the rest. Capacities up to 600 lbs.

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STANDARD GRADES OF PIG IRON

American Iron and Steel Institute

S Phosphorus 0.300 Per Cent Maximum Silvery Pig Iron

This class of pig iron is used for the introduction of silicon into steel or cast iron. The term "silvery" comes from the old fracture nomenclature, and reflects a quality due to high silicon content.

Table 11

Grade Designation	Si	S Max.	P Max.	Mn
S 525100	5.00-5.50	0.05	0.300	1.00 max.
S 575100	5.51-6.00	0.05	0.300	1.00 max.
S 625100	6.01-6.50	0.05	0.300	1.00 max.
S 675100	6.51-7.00	0.05	0.300	1.00 max.
S 725100	7.01-7.50	0.05	0.300	1.00 max.
S 775100	7.51-8.00	0.05	0.300	1.00 max.
S 825100	8.01-8.50	0.05	0.300	1.00 max.
S 875100	8.51-9.00	0.05	0.300	1.00 max.
S 925100	9.01-9.50	0.05	0.300	1.00 max.
S 975100	9.51-10.00	0.05	0.300	1.00 max.
S 1025100	10.01-10.50	0.05	0.300	1.00 max.
S 1075100	10.51-11.00	0.05	0.300	1.00 max.
S 1125100	11.01-11.50	0.05	0.300	1.00 max.
S 1175100	11.51-12.00	0.05	0.300	1.00 max.
S 1225100	12.01-12.50	0.05	0.300	1.00 max.
S 1275100	12.51-13.00	0.05	0.300	1.00 max.
S 1325100	13.01-13.50	0.05	0.300	1.00 max.
S 1375100	13.51-14.00	0.05	0.300	1.00 max.
S 1425100	14.01-14.50	0.05	0.300	1.00 max.
S 1475100	14.51-15.00	0.05	0.300	1.00 max.
S 1525100	15.01-15.50	0.05	0.300	1.00 max.
S 1575100	15.51-16.00	0.05	0.300	1.00 max.
S 1625100	16.01-16.50	0.05	0.300	1.00 max.
S 1675100	16.51-17.00	0.05	0.300	1.00 max.
S 525125	5.00-5.50	0.05	0.300	1.01-1.50
S 575125	5.51-6.00	0.05	0.300	1.01-1.50
S 625125	6.01-6.50	0.05	0.300	1.01-1.50
S 675125	6.51-7.00	0.05	0.300	1.01-1.50
S 725125	7.01-7.50	0.05	0.300	1.01-1.50
S 775125	7.51-8.00	0.05	0.300	1.01-1.50
S 825125	8.01-8.50	0.05	0.300	1.01-1.50
S 875125	8.51-9.00	0.05	0.300	1.01-1.50
S 925125	9.01-9.50	0.05	0.300	1.01-1.50
S 975125	9.51-10.00	0.05	0.300	1.01-1.50
S 1025125	10.01-10.50	0.05	0.300	1.01-1.50
S 1075125	10.51-11.00	0.05	0.300	1.01-1.50
S 1125125	11.01-11.50	0.05	0.300	1.01-1.50
S 1175125	11.51-12.00	0.05	0.300	1.01-1.50
S 1225125	12.01-12.50	0.05	0.300	1.01-1.50
S 1275125	12.51-13.00	0.05	0.300	1.01-1.50
S 1325125	13.01-13.50	0.05	0.300	1.01-1.50
S 1375125	13.51-14.00	0.05	0.300	1.01-1.50
S 1425125	14.01-14.50	0.05	0.300	1.01-1.50
S 1475125	14.51-15.00	0.05	0.300	1.01-1.50
S 1525125	15.01-15.50	0.05	0.300	1.01-1.50
S 1575125	15.51-16.00	0.05	0.300	1.01-1.50
S 1625125	16.01-16.50	0.05	0.300	1.01-1.50
S 1675125	16.51-17.00	0.05	0.300	1.01-1.50
S 525175	5.00-5.01	0.05	0.300	1.51-2.00
S 575175	5.51-6.00	0.05	0.300	1.51-2.00
S 625175	6.01-6.50	0.05	0.300	1.51-2.00
S 675175	6.51-7.00	0.05	0.300	1.51-2.00
S 725175	7.01-7.50	0.05	0.300	1.51-2.00
S 775175	7.51-8.00	0.05	0.300	1.51-2.00

Table II Continued

S 825175	8.01-8.50	0.05	0.300	1.51-2.00
S 875175	8.51-9.00	0.05	0.300	1.51-2.00
S 925175	9.01-9.50	0.05	0.300	1.51-2.00
S 975175	9.51-10.00	0.05	0.300	1.51-2.00
S 1025175	10.01-10.50	0.05	0.300	1.51-2.00
S 1075175	10.51-11.00	0.05	0.300	1.51-2.00
S 1125175	11.01-11.50	0.05	0.300	1.51-2.00
S 1175175	11.51-12.00	0.05	0.300	1.51-2.00
S 1225175	12.01-12.50	0.05	0.300	1.51-2.00
S 1275175	12.51-13.00	0.05	0.300	1.51-2.00
S 1325175	13.01-13.50	0.05	0.300	1.51-2.00
S 1375175	13.51-14.00	0.05	0.300	1.51-2.00
S 1425175	14.01-14.50	0.05	0.300	1.51-2.00
S 1475175	14.51-15.00	0.05	0.300	1.51-2.00
S 1525175	15.01-15.50	0.05	0.300	1.51-2.00
S 1575175	15.51-16.00	0.05	0.300	1.51-2.00
S 1625175	16.01-16.50	0.05	0.300	1.51-2.00
S 1675175	16.51-17.00	0.05	0.300	1.51-2.00

Methods of Chemical Analysis

The standard methods for chemical analysis are those issued by the American Society for Testing Materials. Those methods are published by that Society under the title, "Standard Methods of Chemical Analysis of Steel, Cast Iron, Open-Hearth Iron and Wrought Iron" Serial Designation E 30.

Methods of Sampling Pig Iron

The standard methods for sampling are those issued by the American Society for Testing Materials. Those methods are published by that Society under the title, "Sampling Steel, Cast Iron, Open Hearth Iron, and Wrought Iron." Serial Designation E 59.

Expected Differences Among Analysts

It is recognized that in analyzing pig iron, different analysts working on a properly divided set of drillings from the same sample may not obtain the same results. In such cases, the following variations are regarded as reasonable differences between results:

TABLE 12

Element, per cent		Reasonable Difference
Manganese	0.80 or under	0.03
	Over 0.80 to 1.35 incl.	0.04
	Over 1.35 to 1.75 incl.	0.05
Phosphorus	0.040 or under	0.005
	Over 0.045 to 0.075 incl.	0.006
	Over 0.075 to 0.300 incl.	0.010
	Over 0.300 to 0.400 incl.	0.015
	Over 0.400 to 0.600 incl.	0.020
	Over 0.600 to 0.900 incl.	0.025
Sulphur	0.05 or under	0.005
Silicon	0.50 to 1.50 incl.	0.06
	Over 1.50 to 2.50 incl.	0.07
	Over 2.50 to 3.50 incl.	0.08
	Over 3.50 to 5.00 incl.	0.10
	Over 5.00	0.25

STANDARD GRADES OF FERROALLOYS

American Iron and Steel Institute

Ferroalloys is the term applied to an alloy of iron and some other element or elements (carbon excepted) when such an alloy is to be used as a raw material in the manufacture of ferrous metals. The carbon content of ferroalloys varies from practically nothing to several per cent, depending on the particular ferroalloy and the use for which it is intended. The part played by iron in a ferroalloy is a secondary one; it serves simply as a vehicle for carrying the desired alloying elements.

There are many ferroalloys in common use. Some are used because of the specific properties which they impart to steel when they are dissolved in the iron base, or when they combine with carbon wholly or in part to form carbides. Others are used because of their beneficial effects in ridding steel of impurities, or in rendering impurities harmless. A third group is used to counteract harmful oxides or gases in the steel. The elements of this latter group do not remain in the steel to any great extent after solidification, but are merely fluxes or scavengers of undesirable impurities. Some ferroalloys fall into more than one of the above groups. In addition to the ferroalloys listed herein, other such alloying and scavenging agents have been developed to perform similar functions. Their proprietary nature precludes their being listed as standard products.

Table A—Spiegeleisen

	Grade A Per Cent	Grade B Per Cent	Grade C Per Cent
Manganese	16 to 19	19 to 21	25 to 28
Carbon, not over	6.50	6.50	6.50
Silicon	*	*	*
Phosphorus, not over	0.25	0.25	0.25
Sulphur, not over	0.05	0.05	0.05

* Note: Spiegeleisen may be obtained containing silicon as follows: 1.00 per cent maximum; 1.00 to 2.00 per cent; 2.00 to 3.00 per cent; and 3.50 to 4.50 per cent.

Some ferroalloys are made in the blast furnace, some in the electric furnace, and some are made by the thermit process. Those commonly made in the blast furnace are spiegeleisen, ferromanganese, ferrosilicon and ferro phosphorous.

Spiegeleisen is an alloy of iron and manganese used in basic and acid open hearth steel making practice and in gray and malleable iron. The term is applied commercially to alloys containing up to about 30 per cent manganese. In open hearth practice it is often added with the furnace charge to increase the manganese content, thus decreasing the FeO content of the bath and the oxidation reactions in general. Its most valuable and wide-spread use is for reboiling and blocking both low and high carbon steels. In many cases this use results in moderate desulphurization. Spiegel is seldom substiuted directly for ferromanganese, but in some cases fairly large quantities of the higher silicon grades are used for blocking killed steels, and much manganese is retained for alloy purposes.

Typical analyses of commercial grades of spiegeleisen as given in A.S.T.M. Specification A 98—41 are as shown in Table A:

Ferromanganese. Iron-manganese alloys containing more than 30 per cent manganese are called ferromanganese. Manganese is used as a deoxidizer and desulphurizer in the production of nearly all grades of steel. It reduces the amount of oxygen remaining in the molten steel, and by actively combining with sulphur it removes a principal cause of hot brittleness and imparts to the steel better rolling and forging properties. Manganese also serves as an alloying element in steel, assisting in the production of a fine grain structure and enhancing physical strength and ductility. It is used for this purpose in all grades of steel, whether intended for castings, forgings or rolled products.

The most commonly used grade of ferromanganese alloys is termed "Standard Ferromanganese," often referred to as "80 per cent Ferromanganese," the composition of which is given in A.S.T.M. specification A 99—39, as follows:

Table B—Standard Ferromanganese

	Per Cent
Manganese	78 to 82
Silicon, not over	1.25
Phosphorus, not over	0.35
Carbon, not over	7.50
Sulphur, not over	0.05

Low Phosphorus Ferromanganese is used for adding manganese to acid open hearth steel, and to other kinds of steel in which the phosphorus content must be kept to a minimum. It contains higher silicon, lower carbon and lower phosphorus than standard ferromanganese.

Table C—Low Phosphorus Ferromanganese

Typical Analysis

	Per Cent
Manganese	78 to 82
Silicon, not over	5.00
Phosphorus, not over	0.10
Carbon	5.50 to 6.75

(To be concluded)

PURDUE METALS CASTING CONFERENCE

Offers Varied Program of Papers

By FRANK G. STEINEBACH
and WILLIAM G. GUDE
THE FOUNDRY

PURDUE University was host to some 175 foundrymen at a successful Metals Casting Conference held at West Lafayette, Ind., Nov. 4-5. The two-day meeting marked the first postwar foundry conference at Purdue and was sponsored by the university's Department of General Engineering, School of Chemical and Metallurgical Engineering, and Technical Extension Division in co-operation with the Michiana and Central Indiana Chapters of the American Foundrymen's Society.

C. T. Marek, assistant professor of engineering shop practice and head of the school's foundry department, was chairman of the conference committee which arranged a varied program devoted to discussion of quality control, mechanization, personnel and raw materials. The five individual sessions were well attended by engineering students of the university.

In welcoming the foundrymen to Purdue, Prof. H. A. Bolz, head, Department of General Engineering, indicated the importance of conferences between educators and men of industry. Educational institutions have two main aims, namely the development of knowledge, and the correlation, dissemination and application of that new knowledge. Conferences with industry provide one vehicle to accomplish the latter. Professor Bolz mentioned that Purdue is the largest engineering school in the world, and that more industrial organizations go to Purdue for engineering graduates than to any other school in the country.

Dr. A. A. Potter, dean of engineering, told the group that Purdue had been interested in the foundry industry and castings for a long time. As early as 1889, the university was giving instruction in foundry work. Today the university continues to believe that metal castings are important, and for that reason every freshman engineer is required to take a course in casting. Requiring this course is in line with the belief that the engineer must know something of processes, tools and machines, as well as the application of industrial products.

Dean Potter said the foundry industry has no reason to apologize for its record the last 30 years, because considerable progress has been made. But he believes that the industry should employ more engineering graduates. While the future of the metal casting industry depends to a certain extent on the progress it may make, the greatest factor is the type of government we have in this country. The people and the government must understand the basic factors that have made this nation great, if progress in industry is to continue.

The opening session was concluded with a discussion of "Quality Control for the Practical Foundryman" by Dr. I. W. Burr, associate professor of mathematics. Dallas F. Lunsford, chief metallurgist, Perfect Circle Corp., New Castle, Ind., presided. Dr. Burr described the use of control charts which can plot day-to-day variations in quality performance of a foundry, thereby giving the operator a picture of what is going on and a guide in making decisions affecting operations. They also are helpful in advising when occasional variations from standard do not warrant investigation. Potential benefits from control chart use include the stabilization of practice, savings on additions, decreases in bad castings and closer adherence to desired chemical and physical specifications.

A session on foundry mechanization, presided over by B. E. Gavin, assistant manager, National Malleable & Steel Castings Co., Indianapolis, was opened by a discussion of "Better Labor Relations by Mechanizations" by Bruce L. Simpson, president, National Engineering Co., Chicago. Mr. Simpson recommended that any mechanization program be preceded by an organized clean-up of the plant, starting with the pattern shop, then the foundry yard and proceeding through all departments. Adequate sanitary facilities and a first-aid room likewise should be provided before mechanization starts. Further, the speaker stated, the foundry should learn to make best use of its present equipment before buying new units.

The preferred order of mechanical equipment installation is, first, a shakeout — for correction of dusty conditions; next, mechanical sand preparation facilities—to get sand off the floor and further eliminate dust; then connect sand preparation and molding departments with conveyors. More advanced steps include installation of mold conveyors and automatic mold dumping. It was pointed out that complete mechanization in one package is not necessary for a foundry to get started on its improvement program.

Mr. Simpson's description of how to better foundry working conditions

CONFERENCE COMMITTEE: In charge of arrangements for the recent Purdue conference were: (Front row, left to right)—Prof. G. M. Enos, metallurgical engineering; M. M. McClure, technical extension division; Prof. H. A. Bolz, head of general engineering. (Back row)—R. W. Lindley, chairman of engineering shops, conference secretary; F. T. McGuire, foundry manager, Sibley Machine & Foundry Corp., South Bend; Paul H. Harlan, vice persident, Electric Steel Castings Co., Indianapolis; Keith Glancy, technical extension division; C. T. Marek, assistant professor of engineering shop practice, conference chairman

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through mechanization was prefaced by his report on a questionnaire submitted recently to a group of engineering school students. This survey showed that a large majority of the students are not interested in becoming associated with the foundry industry and that conditions found in foundries they have seen are responsible to a large extent for their attitude. On the other hand, those students interested in foundry work are attracted to it by the possibilities they see in the industry's development.

Mr. Simpson's talk was followed by a motion picture, "New Foundry Horizons," showing modern casting production in a mechanized foundry. Commentary for the film was given by R. L. McIlvaine, vice president and sales manager, National Engineering Co.

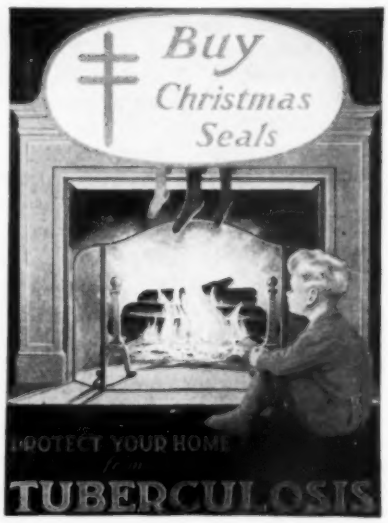
Study Personnel Problems

Foundry personnel problems were discussed by three speakers at a session presided over by Dr. R. W. Field, associate professor of industrial engineering. Speaking on "Labor Procurement," Joe H. Ayres, supervisor of employment and insurance, Armco Steel Corp., Middletown, O., emphasized the importance of making the company's policies and employee program such as to attract and keep good men. Wages naturally are important but the wage factor has been over-emphasized, Mr. Ayres stated, adding that the employee also wants recognition, security and opportunity, and reasons for being proud of his job and his company. The speaker recommended that the company prepare a carefully planned statement of basic policy concerning industrial relations, inaugurate a program to put the policy into effect, and provide an organization trained to carry out the program.

In a subsequent talk on "Labor Training," James G. Purvis, supervisor of training, Armco Steel Corp., pointed out that the individual is a company's most important asset, consequently it is vital that his abilities be developed to the fullest. He also recommended that men be adapted to filling more than one job. Management must set the pattern in a supervisory training and development program, and before starting it should seek the answers to the questions of what it is intended to accomplish, what information and material is to be used, what is the best way to present it, and how to obtain continuous application.

The concluding speaker, Ralph L. Lee, General Motors Corp., Detroit, spoke on "The Personal Element in Employee Relations," in which he stressed the necessity for a company to see that its policies and principles filter out to all employees and, through the latter, to its finished product. Mr. Lee listed numerous qualifications for the kind of a leader the average man seeks. This leader should recognize the importance of each man and his job, and be willing to fight for those under him when they are in the right; he should know most of the answers but admit it when he doesn't; be willing to overlook honest mistakes, and be emotionally stable.

Separate sessions of the ferrous and nonferrous metal divisions were devoted to the general subject of "Mak-



ing the Best Use of Raw Materials in Melting." The ferrous session, presided over by Dr. F. T. McGuire, foundry manager, Sibley Machine & Foundry Corp., South Bend, Ind., was addressed first by R. G. McElwee, Vanadium Corp. of America, Detroit, who made a few general observations prior to individual discussions of gray iron, malleable and steel foundry problems. Because of the shortage of silicon alloys Mr. McElwee recommended that the silicon addition be made in the ladle. The fact that carbon pickup is related to slag viscosity makes slag analysis and control important, the speaker adding that foundries often go too far on the basic side of slag.

R. H. Bancroft, plant manager, Perfect Circle Corp., New Castle, Ind., described some of his company's experiences with material shortages. While it was found that no cupola fuel was as good as the normal grade of by-product coke, small sizes of by-product proved better than beehive coke. Briquets made of coke breeze and 12½ per cent cement worked satisfactorily when the fuel was by-product grade but was unsatisfactory with beehive breeze. Anthracite coal was substituted for 10 per cent of the coke charge for short periods. Texas coke was reportedly high in sulphur and low in heat value.

William Ferrell, general works superintendent, Auto Specialties Mfg. Co., St. Joseph, Mich., urged conservation of materials through better casting design. Coke savings can be effected, he stated, through both moisture control and use of hot blast. Economies experienced by the speaker's company from the hot blast include minimum bridging in the cupola, reduction of 15 to 20 per cent in amount of coke per charge, less oxidation losses, more uniform iron analysis, increased melting rate, less trouble with viscous slag, more annealable iron. Controlled moisture content of the blast was said to produce fewer misruns and cracks in castings, uniform pickup of carbon from the coke, less difficulty in annealing, and definite coke saving. For each increase of 1 grain of moisture per cubic foot of air in the blast it was found necessary to add 10 lb of coke to 5000 lb of metal charged.

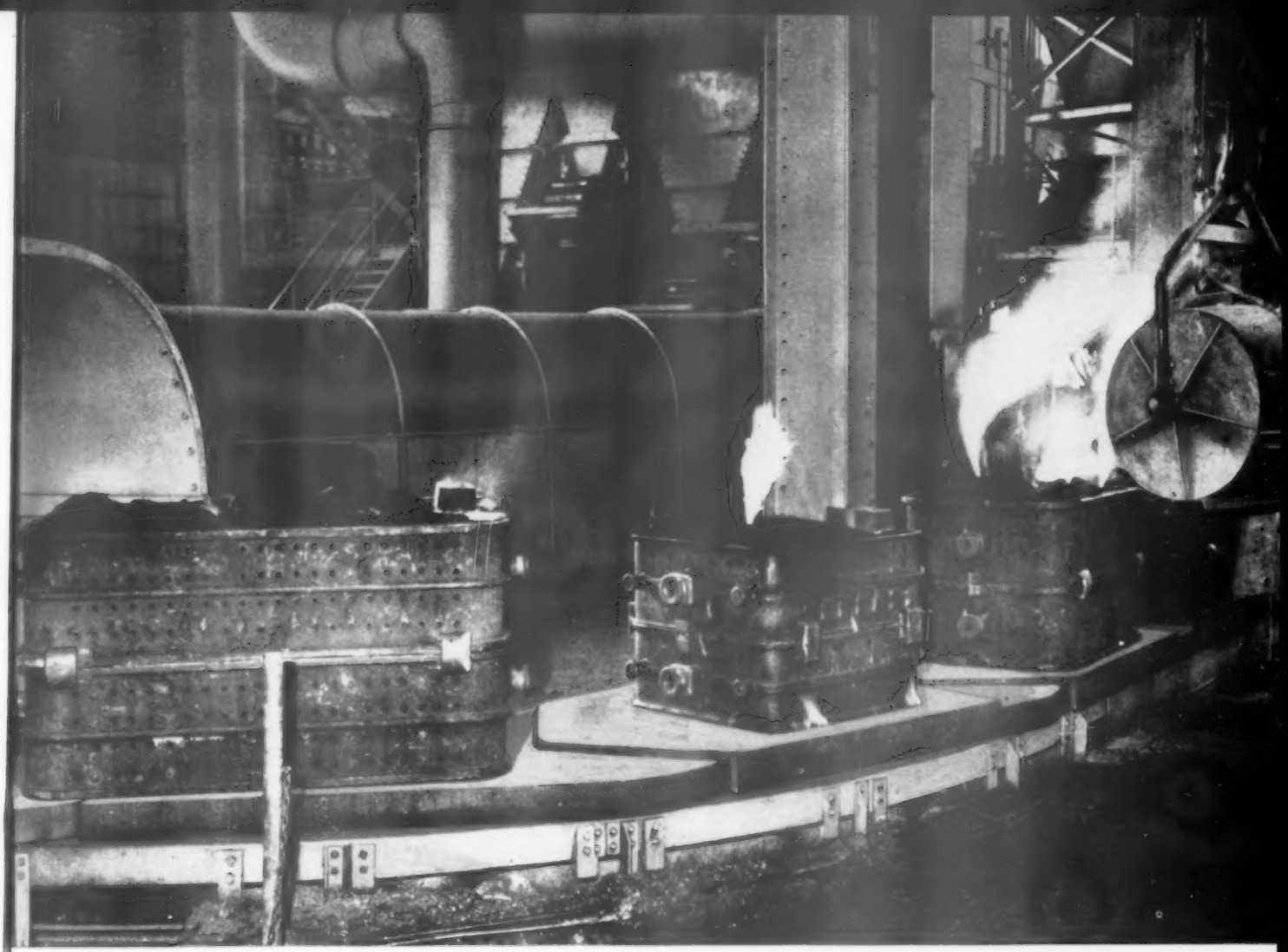
Segrate Steel Scrap

G. C. Dickey, works manager, Harrison Steel Castings Co., Attica, Ind., recommended utilization of carbon steel castings when they will fill the purpose as well as alloyed material. One of the problems incident to scrap is the varying alloy content of material received. This necessitates careful segregation and selection in making up charges. Shortage of low-phos pig iron has practically eliminated that material as an addition in the open hearth, charcoal being the common substitute. In addition to material shortages, Mr. Dickey declared there is a shortage of skilled men to make up the sort of melting crew which is necessary for efficient steel foundry operations.

The nonferrous session featured a talk by Hiram Brown, chief metallurgist, Solar Aircraft Co., Des Moines, Iowa, and a discussion period with Arthur T. Ruppe, foundry superintendent, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind., answering questions on light metals and Robert Langsenkamp, secretary, Langsenkamp-Wheeler Brass Works, Indianapolis, handling problems on brass and bronze. V. S. Spears, representative, American Wheelabrator & Equipment Corp., Mishawaka, Ind., presided.

Mr. Brown suggested an examination of castings to see that they are properly gated, as a means of making the best use of raw materials. He emphasized the importance of segregating scrap, and stated that dross,

(*Concluded on page* 142)



Its clover leaf shape saves floor space

If you have ever said "I wish I had room to get more special, short run production out of this plant" (and most foundrymen have) — you'll be interested in the Bartlett-Snow mold conveyor pictured above. It handles 5 sizes of flasks, for castings ranging from 50 to 650 lbs. each . . . and has permitted production of short run work to be more than doubled.

This mold conveyor loops back and forth in tight curls like a clover leaf or pretzel, and thus provides needed cooling time between pouring and shakeout, in minimum floor space. The conveyor is 468 ft. long and consists of 72 cars of Bartlett-Snow's special design, with 6'6" long over-lapping cast iron tops. The conveyor operates intermittently to accommodate the different time cycles of making copes and drags, and the setting of cores, in large, medium and small size flasks.

The entire cooling section of the conveyor is covered with a Bartlett-Snow smoke hood, and a sidewall dust hood catches the dust and smoke at the shakeout, preventing contamination of the foundry air.

Whether yours is a short run jobbing, or long run repetitive production foundry — let the Bartlett-Snow engineers with their long and intimate familiarity with the needs of practical day to day operation study and analyze your present operation —and suggest ways of making better use of your present floor area and more efficient methods of handling sand, and molds and castings. The C. O. Bartlett & Snow Company, 6200 Harvard Ave., Cleveland 5, Ohio. Engineering representatives in New York, Baltimore, Detroit and Chicago.

BARTLETT-SNOW
CLEVELAND 5, OHIO

DESIGNING AND CONTRACTING ENGINEERS

For the Foundry Industry

SAND, MOLD AND CASTINGS HANDLING EQUIPMENT

(*Concluded from page* 140)
skimmings and grindings should not be thrown away because the secondary smelter can recover an amazing amount of metal from this material.

If metal is being melted to make castings which must meet chemical or physical analysis, Mr. Brown suggested the following precautions: 1. Do not melt scrap of unknown composition; 2. Oily or greasy scrap should not be melted unless smelting facilities are available; 3. Turnings and borings should not be melted unless smelting facilities are available.

A session on casting procurement had as its principal speaker Ben G. Thiel, purchasing-engineer, Waukesha Motor Co., Waukesha, Wis. Dr. G. M. Enos, professor of metallurgical engineering, presided. A buyer of castings, the speaker stated that foundries should stress the importance of cost saving through less machining and manual handling. The user will welcome suggested pattern changes which simplify casting machining. A record kept at Waukesha showed that in 1947 the use of 19,000 tons of castings involved $51,000 in direct labor cost attributable to defective castings. Experience indicates carelessness on the part of foundry shipping departments in checking quantities of castings shipped, Mr. Thiel reporting frequent discrepancies between the actual count and the numbers shown on packing slips and invoices.

Fears Government Encroachment

An interesting discussion of the interrelation between education, government and industry highlighted a banquet Thursday evening at which Paul H. Harlan, vice president, Electric Steel Castings Co., Indianapolis, presided. Dr. Frank Sparks, president, Wabash College, Crawfordsville, Ind., the principal speaker, was introduced by Purdue's president, Dr. Frederick L. Hovde, who also participated in the discussion. Dr. Sparks, a successful industrialist for many years before entering the educational field, fears the effects of encroachment by the federal government into all levels of our educational system. Steps which he strongly favors to ward off governmental domination include increased financial support to private colleges and universities by business and individuals, and adequate state and local taxes which will make federal funds unnecessary for primary and secondary schools and state universities.

C K L Machinery Co., 160 Harrison St., Oshkosh, Wis., has placed contracts for a 48 x 120-ft foundry building to cost about $15,000.

THE DEGASSING OF NONFERROUS METALS

(*Continued from page* 73)

and from the moisture normally present in the atmosphere.

Although metals are susceptible to "gassing" in all types of furnaces, the hydrogen resulting from combustion is most easily transmitted to the metal in furnaces where the flames are in contact with the melt, and is less likely to be picked up in an indirect-fired furnace. Moisture in the atmosphere is also an important source of hydrogen, so much so that changes in humidity are often reflected in a change in the porosity of the castings being produced at the time. Hydrogen can also be introduced into the metal from moisture, oils or other hydrocarbons carried along with the charge.

Even though all gas is eliminated from the metal in the furnace, it will re-absorb hydrogen if provided with an opportunity to do so before it finally solidifies in the casting. Again, the chief source of hydrogen is moisture, either from the atmosphere or from green sand molds.

Porosity Caused By Hydrogen

Appearance of the pinhole porosity caused by hydrogen will vary with the cooling conditions under which it was produced. In general, the more rapidly the metal cools, the smaller and the more rounded are the pinholes. On the other hand, extremely slow cooling may give the gas more opportunity to escape, thereby producing less porosity. The center of a heavy section of a casting will generally have coarser and more irregular porosity than the portion nearer the surface, or in a lighter section of the same casting.

Composition of the metal influences the amount of entrapped gas through its effect on the temperature range over which solidification occurs. For example, pure aluminum solidifies over a very narrow range, so that the hydrogen bubbles have an opportunity to escape through molten metal as soon as they are released. In contrast, in an alloy having a wide solidification range the hydrogen has greater difficulty passing through the mushy metal, and more of it is retained there in the form of pores. Alloying elements also affect porosity formation by changing the hydrogen solubility of the metal. Thus, aluminum-silicon alloys are troublesome although they have a relatively narrow solidification range.

Gas porosity can occur both within a grain and between grain boundaries. The finer the grain structure, the smaller and the more numerous are the gas pores, although the total volume of entrapped gas may not be any greater than in a coarse-grained metal.

Temperature affects porosity because the solubility of hydrogen increases as the temperature is increased. In general, the higher the temperature to which the metal is heated and the longer it is held at an elevated temperature, the more gas it will absorb and the more porosity there will be in the casting.

Other Types of Porosity—Not all of the porosity found in castings is caused by entrapped gas. All of the common metals shrink upon cooling, and porosity will result from this contraction unless there is some compensation for it. Shrinkage can be taken care of by controlling the solidification with adequate and properly located risers, which feed molten metal into the casting as contraction occurs. In some cases, however, it is difficult to completely compensate for contraction because of the cooling characteristics of the metal.

This form of shrinkage porosity, which is primarily due to the cooling characteristics of the metal, is often referred to as microporosity. It consists of minute, irregularly shaped pores more or less uniformly distributed throughout a casting. Individual pores are usually visible only under a microscope, but a sufficient number may sometimes be connected to form a pore visible to the naked eye. This type of porosity is primarily a function of composition. It is most prevalent in light alloys forming a solid solution, because such alloys generally solidify over a wide range, and is least likely to occur in alloys having a high percentage of eutectic, because such alloys usually solidify over a narrow temperature range.

Among the aluminum alloys in which microporosity is most apt to occur are those containing up to 10 per cent magnesium, up to 4.5 per cent copper, or zinc. Silicon and iron form a eutectic and therefore tend to decrease microporosity. Dissolved gas may accentuate microporosity by setting up a back pressure which prevents liquid metal from feeding through the mushy metal into the area where shrinkage is occurring.

If dissolved gas is present in the metal, a true measure of the shrinkage porosity may never be obtained, because the formation of gas pinholes tends to compensate for shrinkage porosity. These pinholes, distributed throughout the metal, have sufficient volume to counteract nor-

(*Continued on page* 145)

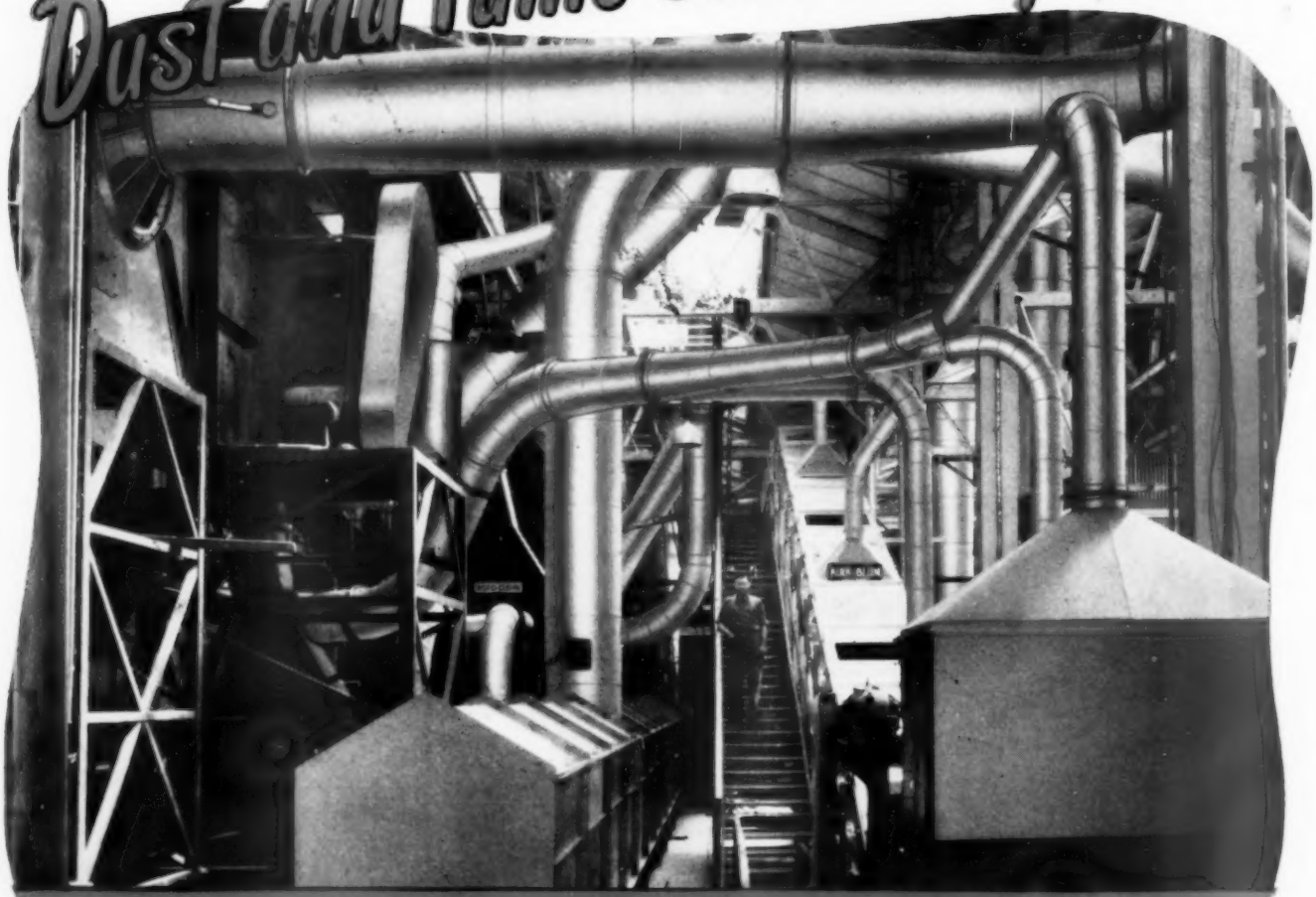
PERFECT LINE UP
of cope and drag
with UNIVERSAL FLASK PINS and BUSHINGS

If you're having trouble with cope and drag line-up on your casting production line and are losing valuable time and metal as a result, *it will pay you to investigate* Universal Flask Pins and Bushings. Precision-made in various standard sizes and shapes, Universal Flask Pins and Bushings can be readily installed in flasks *to insure positive alignment* with minimum effort. Cope bushings are quickly guided to the drag pins over a tapered, loose-fitting closing pin which is easily removed after assembly. Round or elongated bushings and round pin design permits longitudinal expansion resulting from metal heat. *Hardened and ground for lasting accuracy and maximum wear resistance.* Write for folder.

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH, MICHIGAN

Famous implement manufacturer selects KIRK & BLUM

Dust and Fume Control Systems



In the large photo, two mold cooling conveyors are shown to left and right of stairway.

ON the mold cooling conveyor . . . over the production line shake-outs . . . on snagging and grinding machines and at other points in this modern foundry, you'll find KIRK & BLUM Dust and Fume Control Systems. Each was designed to help make this foundry as clean as any in the industry . . . "a good place to work."

Shown above are two views of KIRK & BLUM Dust and Fume Control Systems which provide "Clean Air . . . the invisible tool" in this plant of one of the world's largest farm implement manufacturers. Note the efficient piping arrangement, installed to AFA standards.

The various KIRK & BLUM Systems in this plant are but a few of thousands installed over a period of 40 years in almost every type of industry. Additional photos and data are shown in the free booklet "Dust Collecting Systems in Metal Industries," yours for the asking. The Kirk & Blum Mfg. Co., 2808 Spring Grove Ave., Cincinnati 25, Ohio.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

KIRK AND BLUM

DUST AND FUME CONTROL SYSTEMS

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(*Continued from page* 142)

mal shrinkage. Under exactly the same conditions but in the absence of dissolved gas, the shrinkage will appear in the form of a pipe in the riser or sprue. Hence, the difference in shrinkage between degassed and undegassed metal is often quite marked, since the degassed metal will sink more deeply in the riser or sprue.

Because of the greater shrinkage obtained with degassed metal, it may sometimes be necessary to increase the size of risers over those previously used when the metal was not degassed, in order to prevent the pipe from extending into the casting. Another expedient is to use insulated risers which, in conjunction with degassing, will not only result in high quality castings, but will also permit use of a minimum size riser. Proper gating and risering will eliminate shrinkage porosity so that it is unnecessary to rely upon the compensating effects of dissolved gas.

Prevent Casting Cracks

In one foundry, degassing resulted in the formation of a shrinkage crack in one type of casting. Rather than change the casting design, this tendency to cracking was counteracted by the use of a grain refiner such as boron, titanium or zirconium. The effect of these elements is to greatly multiply the nuclei with which solidification begins, so that solidification occurs more rapidly and uniformly throughout the casting. This is particularly effective in decreasing the differential at the juncture of thin and thick sections where shrinkage cracks most frequently appear.

Pinhole porosity, as the term is generally used, refers specifically to porosity caused by the evolution of gas. Surface porosity takes the form of visible pinholes extending for a depth of 1/16 to 1/8 in. into the casting. This condition is due to faulty molding technique, such as sand that is too wet or impermeable, or to the presence of materials in the melt which react with moisture in the sand to form hydrogen. Included in the latter category are magnesium, calcium, lithium and sodium. The difficulty sometimes experienced in degassing aluminum-silicon alloys may be due to the presence of calcium or sodium as an impurity.

Methods of Decreasing Gas Porosity

1. *Presolidification* — This refers simply to slow cooling to allow sufficient time for the gas to escape as the temperature is lowered, followed by quick remelting to the pouring temperature. While this method by no means completely eliminates porosity, it invariably effects a reduction and is therefore widely practiced. If an oxide skin is present on the metal surface, the removal of dissolved gas is aided by gently breaking this skin to permit the gas to escape. The disadvantages are that presolidification does not do a thorough job of degassing, is slow and time consuming, and markedly increases the cost of melting.

2. *Solid Fluxes*—A wide variety of fluxes can be used to remove hydrogen from molten metals, provided they meet certain requirements. First, they must be free of hydrogen-containing compounds, such as water, which will break down upon contact with the molten metal and tend to increase rather than decrease the hydrogen content. Second, they must not form insoluble compounds which will cause inclusions in the solidified metal. Finally, the flux should be nontoxic and safe to use.

A number of prepared fluxes are on the market and many chemical companies sell the basic materials from which fluxes are compounded. Although a particular flux may be recommended for a wide variety of alloys with the same base, the function of the flux varies widely from one metal to the next so that no one material is satisfactory for all conditions or metals. There is, for example, a great deal of difference between the fluxing problem in aluminum and that in copper, so that completely different fluxes are required for each.

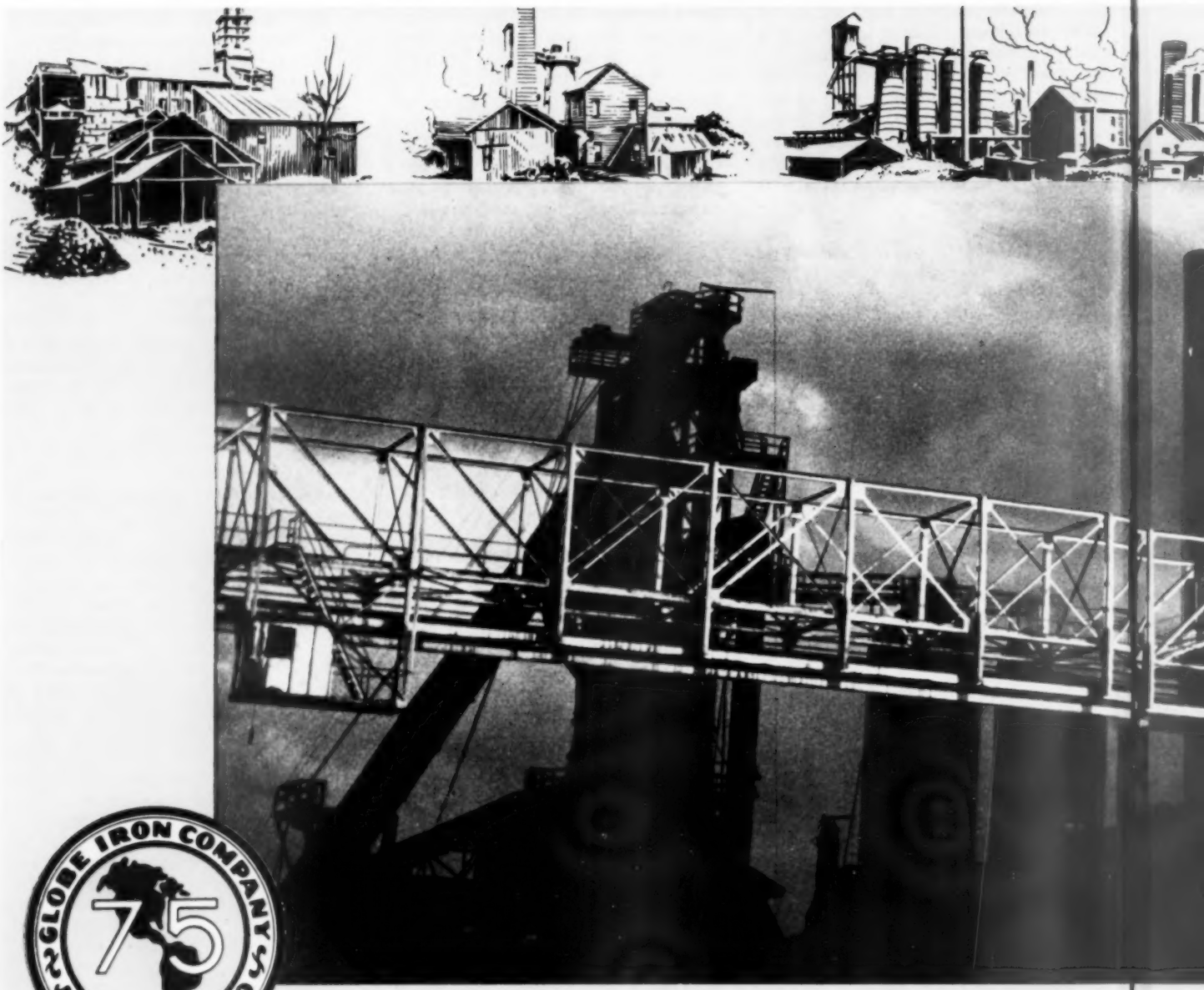
For degassing aluminum alloys, the flux must be free of oxygen which would otherwise react with the metal to form insoluble oxides and which may be retained after casting. On the other hand, in copper-base alloys an oxidizing compound is required, since it has been shown that the hydrogen content of the metal is reduced as the oxygen content is increased. A deoxidizer, such as phos-copper, is then added just before pouring to reduce the copper oxide in the melt.

There are various ways of adding a solid flux, the most common being to throw it on the surface and stir it in. As this method does not get the flux down to the bottom of the melt, a better way is to use the flux in cake or pellet form which either sinks to the bottom naturally or can be pushed there with a bell-shaped tool. A still better way of introducing a flux is to convey it below the metal surface with a nitrogen stream. This latter method gets the flux into the metal at the point where it will do the most good, gives it good dispersion, allows it to be introduced at a controlled rate and uses the flux most economically. This method is more completely described in connection with the fluxing of aluminum.

3. *Liquid Fluxes* — Liquid fluxes, such as carbon tetrachloride, can also be used but the only effective way of getting them into the metal is in the form of vapor. This can be introduced either directly or with the

(*Continued on page* 148)

ALUMINUM TRAILER WHEEL: New trailer wheel of the Trailmobile Co., Cincinnati, is a permanent mold aluminum casting, said to be 55 lb lighter than other types of trailer wheels. The wheel is engineered under completely controlled conditions to provide a casting of uniform density and internal strength. Test bars taken from the wheels show a tensile strength of 40,000 psi. After heat treatment for maximum strength, the wheels are x-rayed and microscopically and chemically tested for conformity to company standards of quality and uniformity

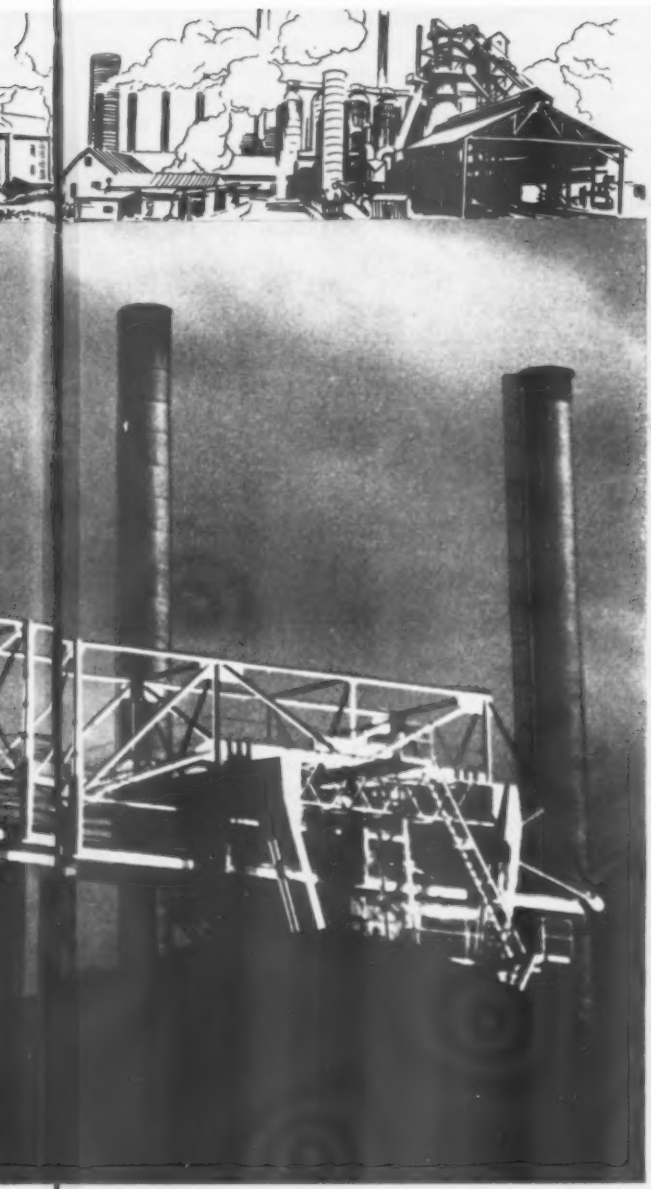


GLOBE IRON COMPANY
75
JACKSON, OHIO

Thomas T. Jones, "Agent" was first president and organizer in 1873.

Eben Jones, son of Thomas T., to[o]k[a]me pr[e]
over the reins of Globe in 1887 at th[e] the ma[n]
death of Thomas T. [p]rior to th[e]

UNDER THE MANAGEMENT OF ONE FAMILY FOR FOUR GENERATIONS



STILL GROWING

. . . AFTER 75 YEARS OF SUCCESSFUL OPERATION

Globe Iron Company was incorporated in 1873, with Thomas T. Jones as founder and president. Operating in the "Hanging Rock District," one of the leading iron-producing areas of that time, Globe played its part in the early development of the iron and steel industry.

New developments in iron production forced operations in the Hanging Rock District to close, one by one. Today Globe is the lone survivor of those early days; surviving because it specialized in the production of special irons for the foundry trade. In the 1890's Globe started regular production of silvery iron and pioneered in introducing this material to the foundry trade.

Globe has continually expanded, adding new equipment, machinery and facilities, and is today the leading exclusive producer of quality Blast Furnace Silvery.

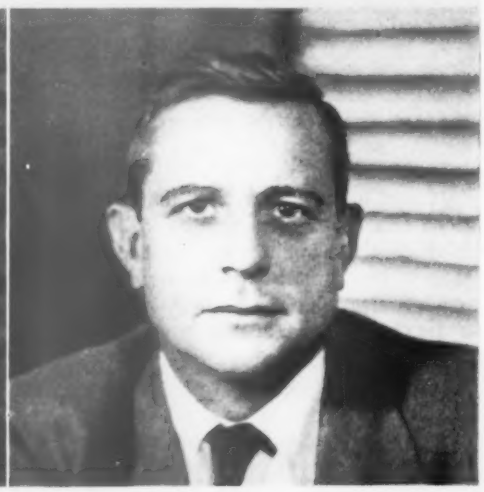
You can depend on Globe to provide, in the future, the same high-quality products and service as in the past.

GLOBE IRON COMPANY
JACKSON, OHIO

1922, Eben's son, John E. Jones, ... became president. He had been active at the the management for many years ...ior to this time.

Now president and directing Globe's expanded long-range program is Edwin A. Jones, who succeeded his father, John E. Jones, on the latter's retirement in 1939.

Marshall H. Jones, brother of Edwin A., now serves as vice president and general manager.



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aid of a gas, such as nitrogen, which is bubbled through the liquid. The latter method is being used but is not common.

4. *Alloy Additions*—In some instances, additions of lithium, sodium, barium and boron are also used to aid in removing dissolved gases from aluminum and copper-base alloys. The disadvantages of these materials are that they decrease the electrical and thermal conductivity and may introduce undesired inclusions which are entrapped in the metal. Unless they are preheated, additional gas will often be introduced into the melt during the addition of the alloy.

5. *Vacuum Melting*—Vacuum melting will remove dissolved gas from metal and thereby reduce porosity but this method requires considerable equipment and is normally used only for small melts for special purposes.

6. *Gaseous Fluxes*—Gaseous fluxes are widely used because of their effectiveness and the ease with which they may be applied. While special benefits are frequently attributed to one or the other of the available gases, experience seems to indicate that a number of gases can be used. Among those which have been tried are nitrogen, chlorine, helium and argon; the first two are in daily use at present, while argon and helium are usually too expensive for this operation except for special cases.

The action by which dissolved gas is removed from molten metal with a flushing gas is purely mechanical. As the bubbles of flushing gas pass upward through the metal on their way to the surface they come into contact with the bubbles of dissolved gas. Only a part of the latter diffuses into the flushing gas bubble and is removed, but each successive contact reduces the dissolved gas volume additionally until eventually a minimum value is achieved.

A second function of the flushing gas is to aid in the removal of oxides and inclusions which are eliminated by floating them to the surface where they are retained in the dross. Again, the action is a mechanical one and requires only that the gas be relatively inert to the metal and that it pass upward through the bath.

It will be apparent that both functions can best be accomplished by introducing the flushing gas at the bottom of the melt in the form of minute bubbles which sweep upward over a maximum area of the melt.

Aluminum and Aluminum Alloys—Aluminum-base alloys were probably the first to which the degassing technique was applied, and a great deal of experimental work has been performed on them. It has been definitely determined that the principal cause of gas porosity is hydrogen. Data are available to show that this gas is highly soluble in molten aluminum but practically insoluble in the solid metal. Consequently, all of the dissolved gas held in the molten metal is released upon solidification; if it cannot escape from the melt, it produces porosity. Nitrogen, oxygen, carbon monoxide, carbon dioxide and sulphur dioxide are all substantially insoluble in aluminum over a wide temperature range.

There is also evidence to indicate that oxide dispersed throughout the metal is a primary cause of unsoundness. In fact, one theory states that all of the hydrogen in the metal is held by the oxide, and that if the oxide is removed the solubility of the molten metal for hydrogen is practically zero. It should be understood, however, that the oxide referred to is in the form of a very thin film, such as occurs on every piece of metal exposed to the atmosphere, and that this film is dispersed throughout the melt. Because of its light and tenuous nature, it has little tendency to rise to the surface naturally, but remains suspended in the melt until forcibly removed.

Nitrogen Flushing—Nitrogen gas is frequently used alone to remove dissolved gas and oxides from aluminum alloys. The oxide film on the surface is relied upon to protect the metal from the atmosphere and additional hydrogen pickup. In this function it is aided by the blanketing effect of the inert gas as it issues from the surface of the melt.

Only dry nitrogen should be used, since moisture will introduce additional hydrogen into the melt. Degassing can be performed either in the furnace or in the ladle; it is generally advisable to do so as close to the time of pouring as possible in order to limit the time after degassing during which hydrogen can be re-absorbed by the molten metal.

The degassing equipment consists of a cylinder of dry nitrogen, a regulator, a flowmeter, hose, a section of ½-in. iron pipe and a graphite fluxing tube. Two types of fluxing tubes are shown in Fig. 3. The one in the center which is preferred, utilizes a piece of porous graphite threaded onto a standard graphite fluxing tube, while in the other the porous material is omitted and replaced by radial holes in the end of the tube.

Cast iron tubes, usually pyrometer sheaths, have been found suitable for the degassing of aluminum in a number of instances, but in others the possibility of iron contamination has made them undesirable. The porous graphite tube is preferred in most cases, not only because it introduces the gas in the form of small bubbles, thereby increasing the effective area of contact but also because it permits higher gas flows without excessive splashing. The principal disadvantages of this tube are its relative fragility and its cost.

A typical nitrogen degassing procedure consists of first preheating the tube sufficiently to drive off any moisture it may have absorbed, and then immersing it in the melt until the end is on the bottom of the crucible. Pre-heating the tube is essential to eliminate the possibility of introducing water below the surface of the metal, since this might cause an explosion. If possible, it is desirable to initiate the degassing process by introducing the nitrogen at a slow rate as soon as the charge in the crucible is molten.

Provides Several Advantages

In addition, the agitation results in a more uniform temperature throughout the melt and, in some cases, an appreciable reduction in the meltdown time. In some crucible furnaces fired by oil, coke or gas it may be impossible to do this, as the velocity of the combustion gases carries off the agitated oxide film from the metal surface and results in objectionable metal loss.

If it is impracticable to degas with the heating flames on, degassing should be accomplished while the crucible is in the furnace. It is important to realize that in most furnaces sufficient heat is available from the furnace walls to increase the temperature of aluminum-base alloys even after the flames are turned off; hence, it is necessary to start degassing the metal when it is approximately 50° F below the desired pouring temperature.

A typical manual operation on a pit-type crucible furnace is shown in Fig. 1. If production warrants, it is desirable to make the process less dependent upon the operator. The degassing tube can be mounted on a hand truck in such a way that it can be moved from furnace to furnace as desired. In other instances it may be desirable to fabricate a permanent framework so that the tube can be immersed in the bath, locked in position for degassing and easily removed at the completion of the operation. In some furnaces it may be possible to locate permanently a porous graphite disk in the bottom through which the nitrogen can be easily dispensed during the meltdown of the

(*Continued on page* 152)

THE Redford CORE BLOWER

CARTRIDGE BENCH TYPE

SEVERAL THOUSAND REDFORDS are now in use in American foundries . . . more and more are being installed. You too will profit by making your small cores with a Redford.

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This foundry uses Redfords because it has a great variety of small work. Core boxes differ considerably in shape and size, yet each operator changes his job many times a day without loss of time. Redford flexibility, speed and simplicity make core blowing profitable, even under the most difficult conditions. The Redford method is original and can not be duplicated by simply reducing the size of conventional core blowers.

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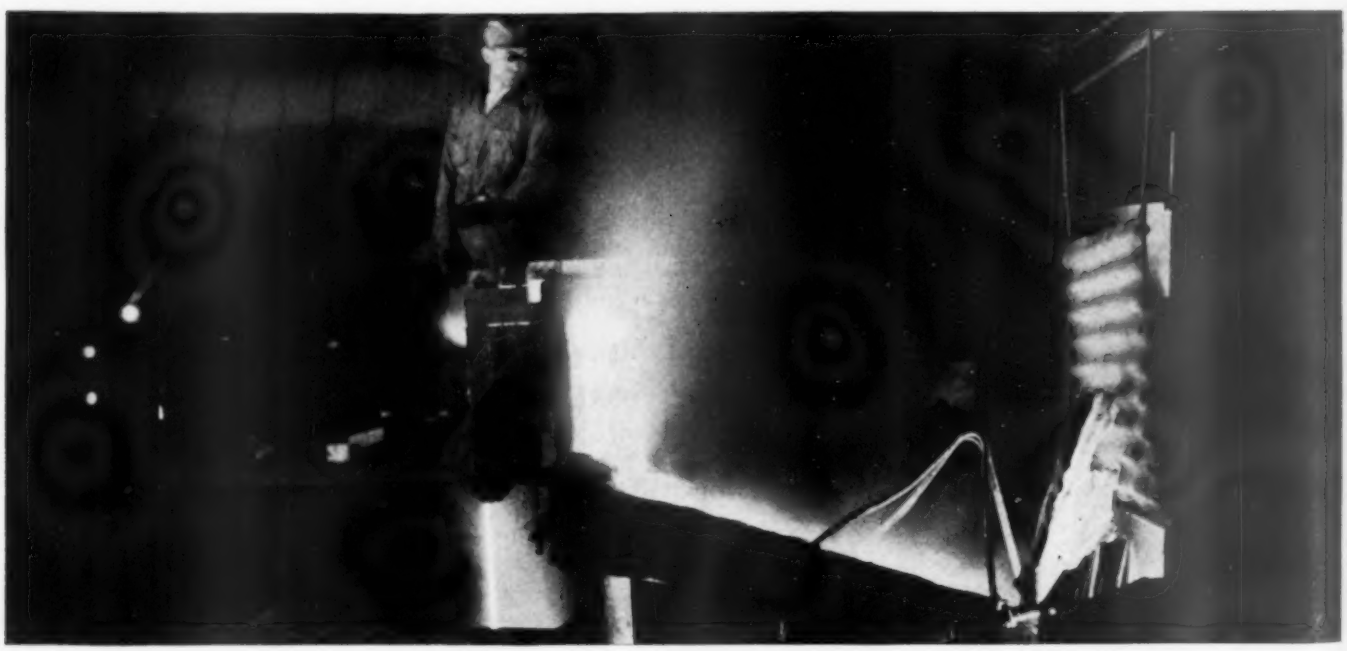
Producing Thin Section M

1 Adding FERROCARBO Briquettes to cupola charge. Processed and packaged for handling ease, the addition of the briquettes is a simple operation.



2 Iron flowing from cupola to air furnace. FERROCARBO Briquettes are a widely accepted agent for obtaining thorough deoxidation.

n Malleable Iron Castings

A fluid iron is required to obtain optimum results in producing thin section malleable castings. When FERROCARBO silicon carbide Briquettes are used in the cupola charge, fluidity is prolonged. Product performance is improved. Scrap loss is reduced. Castings, like the ones illustrated here, are the result.

Because of this experience, considerable attention is being directed to the use of FERROCARBO Briquettes in malleable operations. Complete details can be obtained from our metallurgists.

FERROCARBO Briquettes
BY CARBORUNDUM
TRADE MARK

THE CARBORUNDUM COMPANY, Bonded Products and Abrasive Grain Division, Niagara Falls, New York

FERROCARBO Distributors: Kerchner, Marshall & Co., Pittsburgh, Cleveland, Birmingham, Philadelphia and Buffalo; Miller and Company, Chicago, St. Louis and Cincinnati

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company

3 **Tapping air furnace.** FERROCARBO Briquettes provide prolonged increases in fluidity.

4 **Pouring a casting.** There are less shrinkage cracks and hot tears close to or where risers feed castings.

(*Continued from page* 148)

charge. This disk should be raised above the normal bottom of the furnace to assure that it remains free of metal after pouring, otherwise the metal may clog the openings in the porous graphite.

The rate at which nitrogen is introduced will depend primarily upon the type of tube used, the depth of the metal, its temperature and composition. In general, in order to get the required volume of gas through the metal in a minimum time, the rate should be the maximum that will not cause splashing. Only a gentle rolling action should be visible on the surface of the metal in order not to carry the oxide film beneath the surface. It will be found that a nitrogen flow rate of approximately 20 cu ft per hour will be satisfactory for a crucible containing 150 lb of aluminum. The larger the volume of metal to be treated, the higher the permissible flow rate for the same degree of agitation.

Promote Uniform Temperature

Temperature of the aluminum before immersion of the degassing tube will be lower than that immediately after the start of the nitrogen treatment. This increase in temperature is not caused by a chemical reaction, but is a result of the agitation produced by the nitrogen which mixes the higher temperature metal at the bottom with the lower temperature metal in the upper portion of the crucible. Hence, the metal after nitrogen degassing is at a more uniform temperature.

The minimum quantity of flushing gas required to assure satisfactory results is 25 cu ft per ton of aluminum or aluminum-base alloy. Smaller volumes of gas are beneficial, and in some instances the quantity required to get completely satisfactory results can be reduced somewhat below the value given, depending upon local conditions, but this can only be determined by trial.

The life of the degassing tube can be prolonged by continuing flow of nitrogen through it at a reduced rate after it has been removed from the metal and until its temperature drops below the visible range. It is also desirable to coat the metal cap with a wash of refractory cement to prevent adherence of metal which may splash onto it.

The nitrogen flushing process will eliminate that porosity in castings caused by dissolved gases. It is equally effective on all of the aluminum-base alloys except possibly those containing calcium and magnesium. Chlorine is sometimes preferred on these alloys because this gas is effective in removing, by chemical action, calcium and sodium. However, a 92 per cent aluminum, 8 per cent magnesium alloy has been satisfactorily treated with nitrogen. Other alloys treated contained 92 per cent aluminum, 8 per cent copper, and 88 per cent aluminum with 12 per cent silicon. The specimens shown in Fig. 2 are typical of the results to be expected.

In addition to the visible decrease in porosity effected by the nitrogen degassing operation, it is possible to measure an improvement in the physical properties. Thus, the specific gravity of one alloy was increased from 2.75 to 2.85 and, in practically every case, there will be an increase in tensile strength of 10 to 15 per cent. These increases are often obtained in metal which appears sound before degassing. The grain size is not affected by the nitrogen treatment.

The principal points of comparison between chlorine and nitrogen for degassing may be summarized as follows:

1. Chlorine is corrosive, toxic and a health hazard. With the exercise of proper precautions, however, these disadvantages may be minimized sufficiently to take advantage of its low cost and chemical activity.

2. There is some evidence that chlorine coarsens the grain structure while nitrogen does not. However, control of the grain size is best effected through the use of grain refiners such as boron, titanium and zirconium. The addition of 5 to 10 per cent by weight of one of these elements to the flux is usually sufficient to bring about the desired grain structure.

3. Some users claim that chlorine produces a cleaner melt by reacting with the oxides and floating them to the surface. Although nitrogen itself is inert, it does float oxides to the surface by mechanical action, and it can be used in conjunction with a flux if a chemical-active agent is desired.

4. The fact that the aluminum chloride formed with chlorine is a heavier gas than nitrogen is sometimes listed as an advantage, since it more effectively blankets the metal and prevents hydrogen pickup. Again, this small advantage disappears if a suitable solid flux is used on the surface of the melt.

5. In some cases there is a possibility of nitride formation with nitrogen, but the compounds formed are insoluble at melt temperature and come to the surface.

6. Chlorine chemically removes impurities such as sodium and calcium which are particularly undesirable in aluminum-magnesium alloys. Nitrogen alone will not do so; it will when used with a flux.

Nitrogen Plus a Surface Flux—When nitrogen alone is used as the fluxing agent, as described previously, the aluminum oxide film on the surface is relied upon to protect the metal against additional hydrogen pickup. Care must be taken not to agitate the metal excessively; otherwise oxide particles may be washed under the surface and trapped, eventually appearing as inclusions in the casting. If the metal is properly handled, the use of nitrogen alone produces a satisfactory product and a solid flux will not be required, but in a foundry where close procedure

(*Concluded on page* 154)

Meeting Calendar

Dec. 2-4—American Institute of Mining and Metallurgical Engineers, Electric Furnace Steel Committee, annual conference, Hotel William Penn, Pittsburgh

Dec. 2-4—Society for Experimental Stress Analysis, Annual meeting, Hotel Commodore, New York

1949

Jan. 10-14—Materials Handling Exposition, Philadelphia

Jan. 14—Malleable Founders' Society, semi-annual meeting, Hotel Cleveland, Cleveland

Jan. 24-25—Industrial Furnace Manufacturers Association, meeting, Cleveland

Feb. 9-10—Steel Founders' Society of America, annual meeting, Chicago

Feb. 10-11—Regional Conference, Wisconsin Chapter of AFS, Milwaukee

Feb. 17-19—Regional Conference, Birmingham Chapter of AFS, Birmingham

Feb. 25—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago

Feb. 28-Mar. 4—American Society for Testing Materials, committee week, Edgewater Beach Hotel, Chicago

Mar. 4—Malleable Founders' Society, eastern sectional meeting, New York

Mar. 11-12—Ohio Regional Conference, sponsored by Ohio AFS Chapters, Ohio State University, Columbus, O.

Mar. 25 — Malleable Founders' Society, western sectional meeting, Palmer House, Chicago

Apr. 11-15—American Society for Metals, sixth Western Metal Congress and Exposition, Shrine Auditorium, Los Angeles.

Apr. 14-15—Magnesium Association, annual meeting, Edgewater Beach Hotel, Chicago

Apr. 18-20—American Institute of Mining and Metallurgical Engineers, National Open Hearth Steel Committee annual meeting, Palmer House, Chicago

Apr. 22—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago

May 2-5—American Foundrymen's Society, annual convention, St. Louis

May 20—Malleable Founders' Society, eastern sectional meeting, New York

May 27—Malleable Founders' Society, western sectional meeting, Palmer House, Chicago

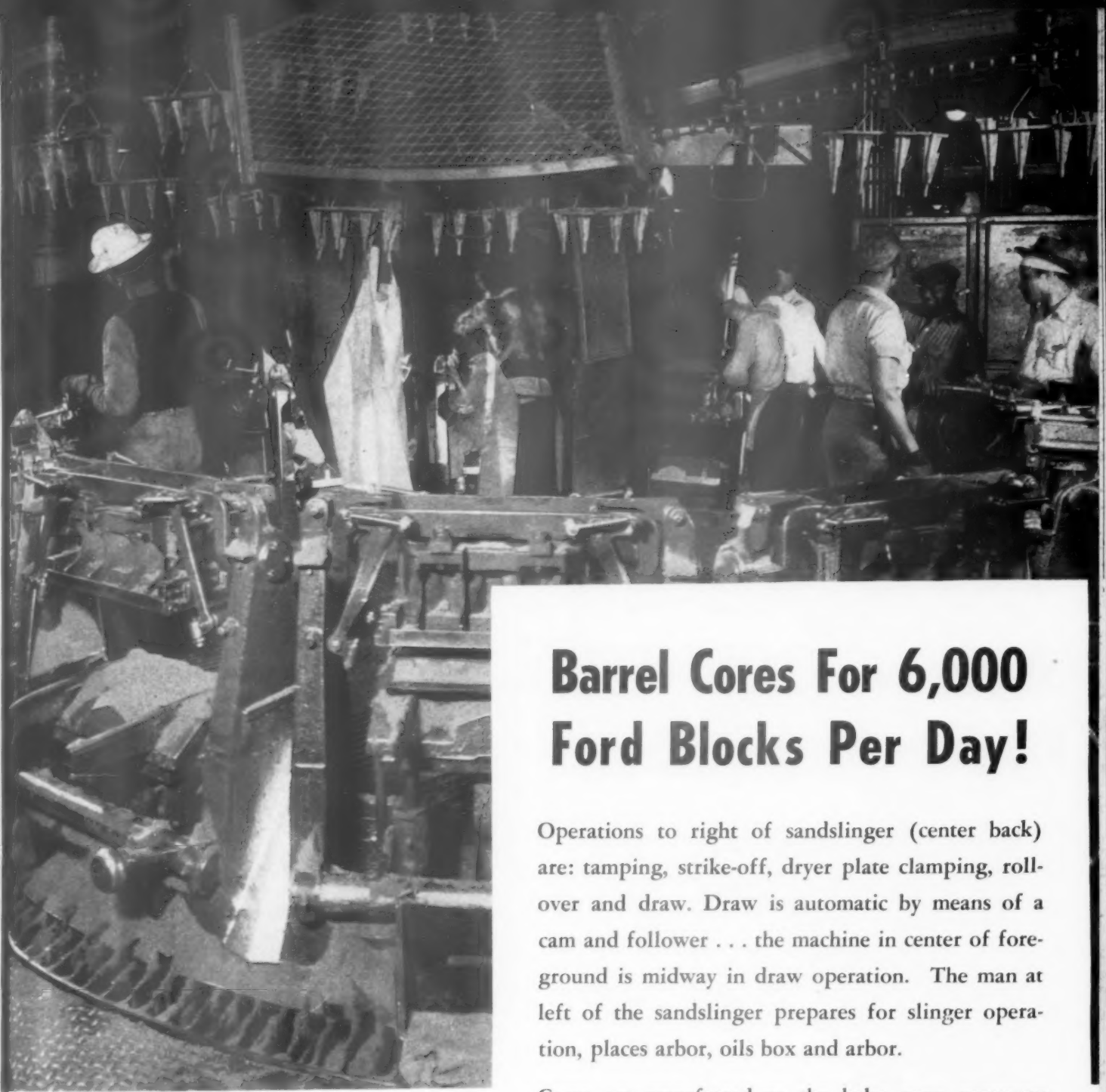
June 16-17—Malleable Founders' Society, annual meeting, Homestead Hotel, Hot Springs, Va.

June 27-July 1—American Society for Testing Materials, annual meeting, Chalfonte-Haddon Hall, Atlantic City, N. J.

Oct. 10-14—American Society for Testing Materials, Pacific Coast meeting, Fairmont Hotel, San Francisco

Oct. 13-15—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulhpur Springs, W. Va.

Oct. 27-28—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago



New Coreroom—Ford Motor Co.—Rouge Plant—designed through the combined efforts of the Ford Production Engineers and Giffels & Vallet, Inc.

Barrel Cores For 6,000 Ford Blocks Per Day!

Operations to right of sandslinger (center back) are: tamping, strike-off, dryer plate clamping, roll-over and draw. Draw is automatic by means of a cam and follower . . . the machine in center of foreground is midway in draw operation. The man at left of the sandslinger prepares for slinger operation, places arbor, oils box and arbor.

Cores are transferred to the bake oven conveyor which passes adjacent to the unloading point. Spill sand is returned to the divided bin above the sandslinger. The dividing plates allow fresh sand to feed with the spill sand by table feeder to sandslinger.

GIFFELS & VALLET, INC.

INDUSTRIAL ENGINEERING DIVISION

1000 MARQUETTE BUILDING, DETROIT

(*Concluded from page* 152)

control is not exercised, it may be desirable to use a small quantity of solid flux thrown onto the surface of the metal.

While the primary function of the flux is to shield the metal from the atmosphere, it serves other useful purposes. It reacts chemically with the dross on the surface, raises its temperature and thereby causes the metal held in the dross to become more fluid and to run back into the crucible. This results in what is known as a dry dross. Another effect of the flux is to aid in the retention in the dross of oxide film floated to the surface by the nitrogen. It accomplishes this by reacting with the oxide and converting it to a form which will remain on the surface.

One large producer of aluminum recommends the use of sodium silicofluoride, a white, granular powder. There are numerous proprietary fluxes available, most of which are beneficial. Regardless of which flux is used, it should never be stirred into the metal, but simply allowed to remain on the surface before, during and after the degassing operation. Wet or damp fluxes can be the source of considerable hydrogen and every precaution should be taken to make certain that the flux is dry. It is also advisable to degas after the flux is added and as close to the time of pouring as possible.

Nitrogen Plus a Gas-Borne Flux— It has long been common practice in the aluminum industry to introduce solid fluxes into the metal by one means or another, and the desirability of carrying the flux into the metal in a stream of nitrogen naturally suggested itself.

This method was tested in the plant of one large producer with good results on 6000-lb ingots going into foil and sheet stock. The aluminum is produced in a furnace having two hearths, one for melting and one for holding the metal until it is cast. The metal is fluxed in both hearths just prior to the casting of each ingot. The usual fluxing method employs aluminum chloride wrapped in aluminum foil to form 1-lb packages which are then placed in a spoon-shaped tool, rapidly inverted and pushed below the surface. The heat gradually converts the flux to a gas which bubbles up to the surface through the metal. This method gave the most satisfactory results prior to the introduction of a nitrogen-conveyed flux.

A series of tests in which various fluxes were introduced with nitrogen led to the conclusion that sodium silicofluoride introduced in this manner yielded the best metal. Comparison was based upon the number of "blisters" produced during subsequent rolling, since these blisters are apparently due to the expansion of entrapped gas at rolling temperatures as the metal is converted into sheets of thin foil.

The equipment used for this purpose consisted of a hopper, a vibratory feeder, a mixing chamber where the powder is introduced into the gas stream, and the necessary control equipment. With this equipment, it is possible to introduce a given quantity of powder, at a constant rate and constant flux-to-gas ratio, for a predetermined time interval. The sequence and duration of operations is controlled automatically by electrical timers, leaving nothing for the operator to do except to insert the tube into, and remove it from, the furnace.

(*To be concluded next month*)

GIANT CRANE: Rubber-tired, two-engined mobile crane, said to be the world's largest, has a lifting capacity on outriggers of 45 tons at a 12-ft radius. The giant crane weighs 65 tons and has the following dimensions: Length, with boom in travel position over front of carrier, 66 ft, 5 in.; width, outside to outside of tires, 11 ft, 7¾ in.; height, with gantry erected, 19 ft, 5 in., with gantry lowered, 14 ft. Standard boom is 50 ft long and is made up of 25-ft top and bottom sections. Center sections in 5, 10, 15, 20 and 25-ft lengths may be used to give a maximum boom length of 100 ft. The crane is equipped with two diesel engines—one rated at 225 hp propels the carrier up to speeds of 18 mph. The other engine powers the turntable mounted on the carrier. The huge crane is a product of Thew Shovel Co., Lorain, O.

FEMA HOLDS 30th ANNUAL MEETING

(*Continued from page* 134)

market.

Changes in conditions will require more aggressive use of all the tools of selling-advertising, sales promotion and more intensive sales efforts. The job of selling will have to be directed to top management as well as to men in the industry. Manufacturers may find it increasingly necessary to attract business by extending the usefulness of the products, wherever possible, through the development of new products, and by making the products more appealing through improvements that warrant the replacement of worn-out or obsolete equipment. Mr. Pfaff suggested that in the engineering development and design work, more attention might be given to smaller foundries, and to adapting equipment to meet special needs of certain foundries. In his opinion it will become increasingly important in the future that foundry equipment manufacturers earn the reputation that comes only from progressive product development that keeps pace with the problems of foundry operation

Arthur J. Tuscany, executive secretary of the association, presented a complete report of activities during the past year. He reviewed the work of the directors, and the activities of the various FEMA committees, including the recent organization of a special advisory committee to the

(*Concluded on page* 156)

STERLING OF INDUSTRY "THE WHEELS"

For better, faster weld and casting cleaning, specify these portables . . .

These Sterling "Wheels of Industry" are rugged enough to stand up under the demands of any portable grinding job and, at the same time, provide better than usual service. They are made for each individual job . . have the correct bond, grain, structure, shape, and size to handle easily and efficiently on castings, welds, and other rough surfaces.

A wide range of finishes is possible, depending upon the specification selected for your particular job. Sterling engineers, skilled by years of experience on all types of portable grinding, can suggest the wheel for your use.

Decide today to take advantage of the better production that is possible when the "Wheels of Industry" are working for you. Write!

Send today for the Sterling Specification Selector.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

(*Concluded from page* 154)

Public Relations Committee. Product groups continue to make progress, and several meetings of these different groups were held during the year.

Mr. Tuscany pointed out that the association has given wholehearted support to the National Castings Council, and to the Foundry Educational Foundation. The association also is represented on the American Standard Association Committee Z-9 on Safety Code for Exhaust Systems.

During the year the association secured from member companies the names of nearly 40 individuals who are qualified and willing to appear before foundry meetings, chapters of American Foundrymen's Society, trade associations and other groups, and this information has been supplied interested organizations. FEMA also published a year-book entitled "Our 30th Year."

Finances In Excellent Condition

Mr. Tuscany reported that the association has co-operated to the fullest extent with the Foundry Equipment and Supplies unit of the National Security Resources Board, headed by Lee C. Wilson, in a study of the equipment and supplies industries. He also reported on the equipment industry representation on the Foundry Industry Advisory Committee to the Munitions Board.

As treasurer of the association, Mr. Tuscany presented a report that indicated the finances of the organization are in excellent condition.

E. A. Borch, secretary, National Metal Abrasive Co., Cleveland, and chairman of the Statistical Committee, presented an interesting discussion on "Interpreting FEMA Business Trend Reports," which indicated that this material can be of considerable value to those companies participating in the reports.

An interesting picture of the present situation in Great Britain and the Continent was presented in talks by Edward J. Burnell, vice president and general sales manager, Link-Belt Co., Chicago, and John Hellstrom, vice president, American Air Filter Co., Louisville. Mr. Burnell stated that British trade conditions are improving, that people are working and are working very intelligently. Nationalization of industry is the most discussed topic in Great Britain. The loans made by the United States are not popular since many feel that these grants help perpetuate the Labor Party in power. Mr. Burnell feels that the attitude of the British people is good and that they will come through in the usual way.

Mr. Hellstrom reported that in Sweden, industrial plants are busy with a 4 to 5 year backlog. Labor shortages are severe and frequently industry must supply housing if it is to secure labor. Too many people are working for the government. Denmark has not recovered as much as some of the other countries. Its principal export was food for England, and that country is not buying. Holland is figuring on considerable export business to South Africa. Paris seems to be as happy and as go lucky as ever.

Mr. Burnell said the greatest thrill on his trip was the sight of New York harbor on the way back, and Mr. Hellstrom emphasized the fact that he was glad to be back in this country.

Saturday morning, Lee C. Wilson, consultant on foundry equipment and supplies for the National Security Resources Board, discussed in some detail "Industrial Mobilization under the Preparedness Program." Mr. Wilson outlined the duties and functions of NSRB, and then discussed the survey of the foundry equipment and supplies industries in connection with preparedness. Mr. Wilson paid tribute to the FEMA and to its members for the splendid co-operation he has received in connection with the equipment study. The report on the study will be completed shortly.

Favors 2 Year Exhibitions

W. B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., and president of the American Foundrymen's Society, expressed great appreciation to the FEMA and its president for the splendid co-operation that has been given mutual problems. Mr. Wallis also thanked the members of the association for their contributions to the success of the recent Philadelphia Foundry Show. He assured the FEMA that the board of directors of AFS had gone on record establishing an every-other-year basis for foundry shows. Mr. Wallis also extended an invitation to the annual technical convention of the AFS to be held in St. Louis, May 2-5.

Frank G. Steinebach, editor, THE FOUNDRY, Cleveland, and secretary of the National Castings Council, discussed the activities of the council during the past year.

C. A. Barnett, president, Foundry Equipment Co., Cleveland, and one of two FEMA representatives serving as trustees of the Foundry Educational Foundation, presented a report on the activities of that organization. Mr. Barnett indicated that the program is well under way in six schools and that the effort is filling a definite need in the field of training men for foundry work.

Thomas Kaveny Jr., president, Herman Pneumatic Machine Co., Pittsburgh, and the foundry equipment industry representative on the Foundry Industry Advisory Committee to the Munitions Board, reported on the recent organizational meeting of that committee.

Lester B. Knight, Lester B. Knight & Associates, Chicago, and the official representative of the AFS to the recent International Foundry Congress at Prague, Czechoslovakia, gave a very interesting off-the-record report on his trip.

An open forum closed the meeting

CANADIAN FOUNDERS MEET IN MONTREAL

(*Concluded from page* 130)

mation and removal of slag.

J. Dalby, Wilson Brass & Aluminum Foundries Ltd., Toronto, and H. J. Roast served as joint chairmen at the nonferrous group meeting. J. C. Converse, Crane Ltd., Montreal, discussed modern methods of brass foundry operation. H. W. Bennett, Dominion Engineering Works Ltd., Montreal, discussed molding methods. J. C. Converse suggested it may be desirable to hold a weekly scrap meeting. While scrap reduction is a major factor in good foundry operation, it is not the controlling factor. The good castings produced are what keep the foundry in operation. Mr. Bennett showed a number of slides illustrating the methods employed in making the castings.

W. B. Wallis, president, American Foundrymen's Society, and E. M. Delahunt, national director, AFS, for Canada, were the speakers at the closing stag dinner Friday night under the chairmanship of O. L. Voisard.

Organization committee included James Newman, Newman Foundry Supply Ltd., Montreal, chairman, with Henry Louette, Warden King Co. Ltd., and Art Hughes, co-vice chairmen. Detail committees were set up under the following chairmen: Program, Alfred Lewis, Dominion Works, Ltd. Publicity—Robert Cameron, Webster & Sons Ltd. Plant visitation—G. W. Paterson, Refractories Engineering & Supplies Ltd. Registration—Lucien Guilmette, Canadian Foundry Supplies & Equipment Ltd. Entertainment—Cecil Rowe, Crane Ltd.

Price Pfister Brass Mfg. Co., 3011 Humboldt St., Los Angeles, plans construction of a $23,200 storage building at the side of its plant.

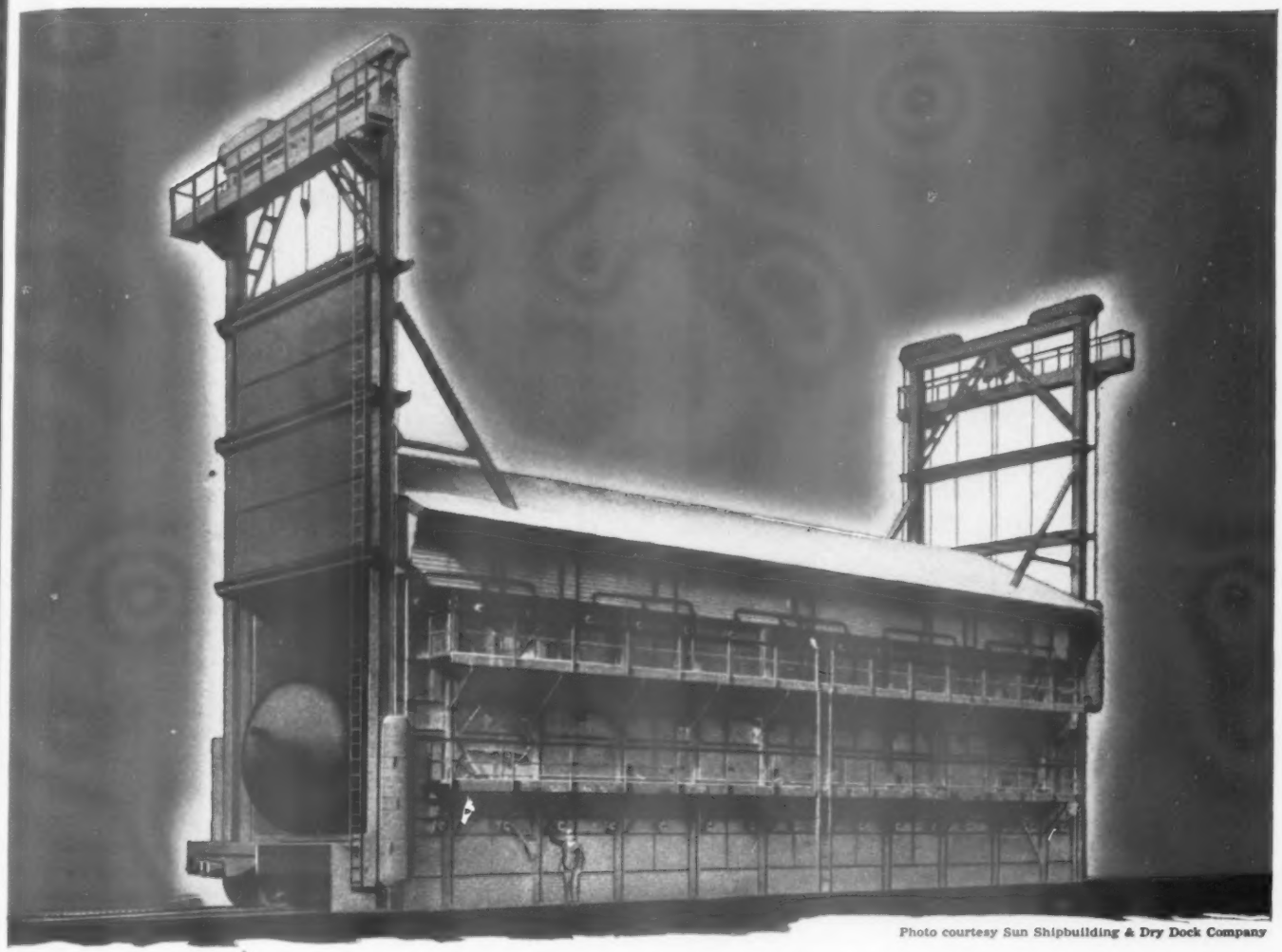


Photo courtesy Sun Shipbuilding & Dry Dock Company

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R-310

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EFFECT OF GASES ON TIN BRONZE

(*Continued from page* 96)

Unfortunately, bronzes contain no elements which form a gas upon reaction with oxygen, therefore a self-boil cannot be produced. It should be possible, however, to cause a boil by passing an inactive gas through the molten bath. As explained earlier, nitrogen probably will not form a stable compound with any constituent of an ordinary bronze. If we pass nitrogen through the bath we would simulate a "boil." The bubbles of nitrogen, passing through the bath should pick up the dissolved hydrogen and carry it away. This method has been successful with aluminum, also to some extent with alloy steels using argon as the non-active gas. To date, however, tests on flushing bronzes with gases have not been very successful for several possible reasons. First, it has been difficult to disperse the gas in sufficiently small bubbles to be really effective, although research now being conducted indicates that some improvement is effected. In this connection it might be pointed out that Baker and Child[2] state that bubbling a gentle stream of dry nitrogen through the melt does not insure degasification, but bubbling a rapid stream (500-600 liters per hr) of nitrogen through the metal gave degassed castings with excellent mechanical properties.

Use Oxidizing Agents in Bath

Another method which has been proved successful is the use of oxidizing agents in contact with the molten bath. Lambert and DePierre[3] described the use of potassium nitrate added with the charge in eliminating leakage when making phosphor-bronze pressure castings, also pressure castings of ounce metal (85-5-5-5 alloy). Their method was found to be successful when virgin metals were used, but was not entirely successful when using returned scrap and remelted ingot. Baker and Child[2] have reported some success from the use of fluxes composed of potassium nitrate and copper oxide, but obtained the best results with the use of manganese ore alone placed in the bottom of the melting crucible before adding the metal. During melting, the manganese ore tends to remain at the bottom of the pot, slowly giving up its oxygen which, as it bubbles up through the bath, either unites with the dissolved hydrogen forming water vapor, according to the reverse of reaction (3), which is expelled from the melt; or carries this hydrogen off mechanically as described previously in the case of nitrogen. Regardless of the mechanism, hydrogen gas is eliminated by this method and improved soundness results. Needless to say, when using any oxidizing method, it will be necessary to increase the amount of phosphor-copper or other deoxidizing agent before pouring the melt, if sound castings are to be obtained. Considerably more work will be necessary, however, before any physical or chemical degassing method becomes universally applicable.

It should be mentioned at this time that the presence of reducing agents already present in the ingot or scrap have considerable influence upon the effectiveness of any oxidizing operation. Such reducing agents are zinc and phosphorus which have a strong affinity for oxygen, and tin which introduces only slight reducing effect. When such elements are present, the first effect of the oxides is to react with these strongly reducing elements and cause their elimination from the molten bath. Until these are almost completely eliminated, little or no oxygen will be available for removing hydrogen. This may be one of the reasons why Lambert and DePierre found that potassium nitrate did not work successfully with scrap and returns, but was suitable when the copper was melted first, then the tin, zinc and phosphorus added subsequently.

The author has noted the tendency in a number of foundries to adding phosphor-copper with the charge in the furnace. By using this method of charging, any tendency to eliminate hydrogen or to prevent it from entering the bath, such as might be effected by oxidizing atmospheres or the use of oxidizing agents in the bath, is more or less defeated, as the phosphorus will immediately absorb all the oxygen, thus increasing the tendency to absorption of hydrogen. The author can advance no logical reason why phosphor-copper should be added at any time before the heat is ready to be tapped from the furnace. This statement also includes the melting of phosphor bronzes and those containing considerable percentages of zinc.

Fluxes are in rather general use in the nonferrous industry. They are used for various purposes such as purifying the metal to prevent gassiness, and to eliminate dross and impurities. Claims for some of the proprietary fluxes range all the way from merely furnishing a cover during the melting, to removing all kinds of impurities, including gas, also many of the normally solid impurities, thus permitting the production of sound castings from the cheapest scrap. Fluxes, used judiciously and correctly, can aid in the elimination of many defects, but will not take the place of good melting techniques, nor will they make a good metal out of a poor one by simply bringing the metal in contact with the flux.

In order to remove the solid impurities from a bath of metal, all the metal must come into intimate contact with the reacting agent. Most fluxes float on top of the molten bath. In order that the requirement of intimate contact can be fulfilled, the bath must be stirred mechanically, by convection currents, or by electric induction currents. Regardless of the stirring method, it will take a long time to provide the intimate contact necessary, much longer than the time consumed in any foundry melting equipment between the time of charging and tapping the furnace. Furthermore, the flux must be stirred as well. If not, only a small layer will come into contact with the metal and its usefulness as a purifying agent will soon be ended.

Charcoal Employed as Flux

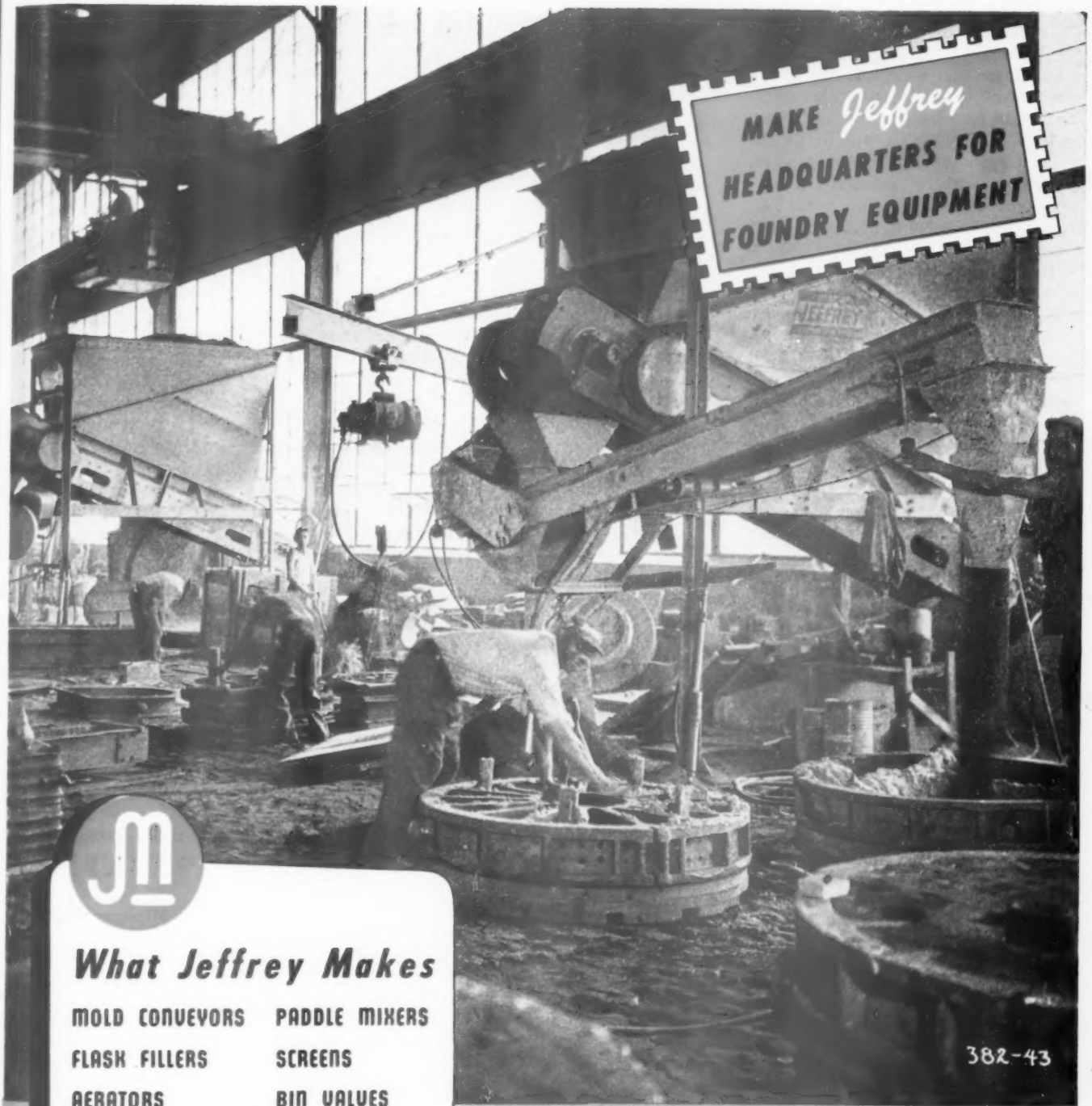
What then should be the chief purpose of flux? About the only action will be to prevent the entry of harmful gases into the metal, and, probably to a lesser extent, provide some oxidation to help free the metal of gases which have already been dissolved. One of the commonly used fluxes is ordinary powdered charcoal. Charcoal, being practically very fine carbon in an exceptionally reactive state, is a strong reducing agent. Such being the case, a layer on top of the molten bath will absorb and chemically combine with all oxygen which has been purposely allowed to enter the atmosphere above the melt for reasons already presented, but will permit hydrogen to pass through without hindrance and dissolve in the metal. That this is the case is indicated by the fact that bronze heats, previously gas free, have been badly gassed and the resultant castings made extremely porous simply by placing a thin layer of dry charcoal on the surface of the bath which was exposed to the atmosphere which always contains a small amount of water vapor.

If heats are susceptible to gassing as easily as mentioned above, what must happen in a fuel-fired furnace where the proportion of water vapor is high? When this water vapor comes into contact with the hot charcoal it will immediately react as follows:

(7) $H_2O + C = CO + 2H$

This reaction is not reversible,

(*Continued on page* 160)



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High-speed Molding Stations showing Jeffrey Flask Fillers (overhead bin type) in operation.

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(*Continued from page* 158)

which means that all the hydrogen present in the water vapor which comes into contact with the charcoal will be changed to hydrogen, and as this hydrogen will be in the nascent state when it is first formed, conditions will be especially favorable to its solution in the metal. As previously mentioned, because of the presence of the hot charcoal, there will be no oxygen present to prevent this solution.

If the charcoal is not thoroughly dry, the condition will be aggravated, and we will get hydrogen pick-up even though no water vapor is formed in the furnace. Charcoal is one of the most powerful compounds known for absorbing gases which in plain words, means that it has a great affinity for gases which become concentrated on the surface of each individual particle. A very short time of standing in the air will result in the absorption of considerable amounts of water vapor. Added to this, water is often used to quench charcoal to prevent excessive loss from burning when the retorts in which it is produced are opened. Any water vapor present in the charcoal when it is added to the hot metal will immediately break up and form nascent hydrogen as indicated by reaction (7). The use of charcoal as a flux is, therefore, fraught with danger and will almost invariably result in gassing the metal.

Other fluxes will be almost as dangerous unless they are thoroughly dried to remove all absorbed moisture. If any moisture is present, it will be changed to steam and thus become a potential source of hydrogen. The same can be said of fluxes which contain water of crystallization, which, under the temperature of the bath, break up and give off this water of crystallization. There is no real objection to the use of a cover flux if the operator prefers one, but the author's experience leads him to the belief that its use is often an unnecessary expense.

Glass, which is very commonly used as a flux is probably the most fool proof material which could be used for this purpose. It does not absorb moisture and it contains no constituents which will dissolve in the bath, neither will it remove any constituents from the metal. Its action is that of a highly viscous cover which not only tends to collect any dross which may be formed, and permits its removal from the surface of the metal, but it will help to prevent the entrance of gases into the melt. By the same reasoning, however, its presence will also tend to prevent gases from leaving the metal.

A chemical flux, or one which decomposes during the melting operation to produce oxidizing gases is a different matter. Such fluxes, by their oxidizing action, will tend to prevent hydrogen entering the metal. Examples of such fluxes are those containing potassium nitrate, copper oxide or other compounds which give off oxygen upon being heated or upon coming into contact with certain reducing components of the bath. Flux should be dry when added.

The previous article dealing with the subject of dendritic growth recommended pouring the mold at as low a temperature as practicable. The same is true during the melting process. The solubility of gases in molten metal increases with increase in the metal temperature. A little thought will show, then, that as the metal is heated higher and higher above the melting point, the greater becomes the tendency to gas solution, mainly because of the increased solubility at the higher temperatures, but also because of the greater percentage of soluble gases formed from increased dissociation of water vapor at the higher temperatures. For this reason we should bend every effort to prevent heating metal any hotter than is absolutely necessary to transfer it and pour it into the molds.

In order to obtain the required close control of metal temperature, it is necessary to have some method of measuring and preferably recording the temperature of each heat. This is a simple matter with low melting point metals such as aluminum alloys where thermocouples are applicable; also for higher melting point metals such as steel and gray pyrometers can be used. Molten bronze, falling between these two extremes is too hot for the use of thermocouples for longer than very short intervals, which does not make for the required accuracy or convenience; and is too cool to obtain accurate readings by the optical or radiation methods. There is considerable need for the development of equipment for the continuous and accurate measurement of molten bronze temperatures. It is true that we have pyrometers and thermocouples by which intermittent readings of a few seconds duration can be made. When real accuracy is required, however, their use would require the full time of one person, as well as having other evident disadvantages.

No Effect on Microporosity

While on the subject of temperature, it will be well to consider another phase of the subject. Recommendations have been made to remove the metal from the furnace and allow it to stand on the foundry floor for a few minutes in order that it may rid itself of dissolved gases before pouring. The only gases which can possibly be removed by such a method would be occluded gases and that small portion of the dissolved gases which is above the limit of solubility at the particular temperature to which the metal is cooled.

Such standing might have a slight effect in reducing gross porosity, but it would have no effect whatever upon microscopic porosity which is caused by the gas which separates at the time of solidification. Furthermore, if we are to permit the metal to stand on the floor, losing temperature all the time that it is standing, it is evident that we must heat the metal just that much hotter than would otherwise be necessary, thus introducing the consequent dan-

(*Concluded on page* 162)

METALLURGY CLASS of Ohio University, Athens, O., visited the Jackson Iron & Steel Co., Jackson, O., recently, to observe the operation of a blast furnace producing silvery pig iron. Dean E. J. Taylor of the College of Applied Science and Prof. L. V. Calvin were in charge of the group. Wilfred H. White, company metallurgist, addressed the group briefly before conducting the class through the plant

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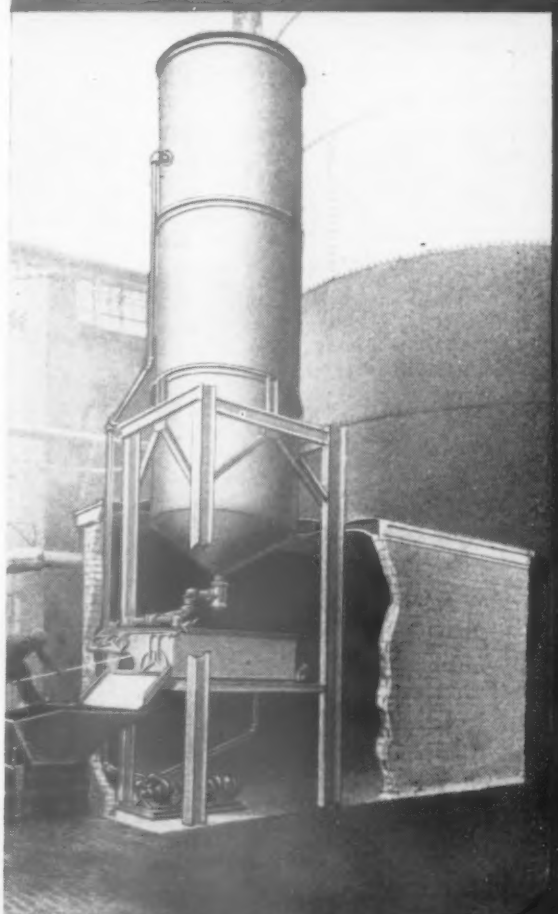
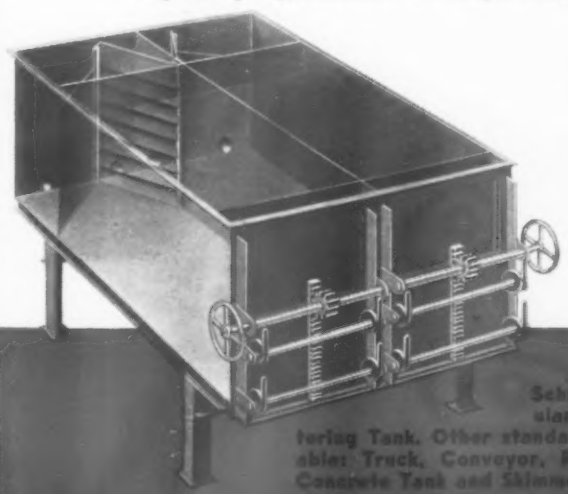


Disposal of collected dust, as sludge, is an easy task at this nonferrous foundry. Schneible Multi-Wash Collector is also shown.



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LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION

(*Concluded from page* 160)

ger of adding more gas to the metal than we would be getting rid of by allowing it to stand.

Much more will be gained by correct melting to only that temperature necessary to get it into the molds at the minimum allowable pouring temperature. Every degree which the metal is heated above this temperature increases the likelihood of porosity in the finished casting. Once heated to the correct temperature, it should be poured with as little loss of time as possible. To obtain this condition, the molding and pouring procedure should be arranged in such a manner that the metal never will have to await the completion of the molds. If the two operations cannot be synchronized exactly, the molds should await the metal.

Although hydrogen is considered to be the chief cause of shrinkage porosity in tin bronzes, there are indications that if this is the only gas present, a considerable amount will remain in solid solution in the metal, and in this state would have no direct effect in causing porosity. On the other hand considerable amounts of oxygen may be present without causing any apparent harm. That is, either of these gases may be present in certain small amounts without being harmful, provided that they are present alone. The presence of a trace of oxide apparently decreases the solid solubility of the hydrogen, and therefore will cause porosity with much lower concentrations of hydrogen than would be the case if hydrogen was present by itself.

Removed Hydrogen In Bath

Although oxidation of the bath is an effective way of removing hydrogen, there will always be traces of this gas which cannot be removed. In the presence of oxygen, this hydrogen would be almost certain to cause shrinkage porosity. It is evident then that the metal should be thoroughly deoxidized before being poured in order to reduce the oxygen or oxide content to as low a concentration as possible. The author has corrected a number of extremely bad cases of shrinkage, merely by complete deoxidation with phosphor-copper. A good practice in this connection when leakage occurs is to fracture the part. If the fracture is coarse-grained and discolored, the discoloration is likely due to oxidation. Often this condition can be corrected by deoxidation alone.

The usual recommendations are to use 2 to 3 oz of 15 per cent phosphor-copper per 100 lb of metal. If the metal is heavily oxidized, however, more than this may be required. Sufficient deoxidizer should be added to prevent the formation of a heavy oxide scum over the ladle of metal. With thorough deoxidation, the stream of metal entering the mold should show little or no tendency to carry an oxide scum into the pouring basin. If correctly deoxidized, the phosphorus should be almost entirely used up and only traces appear in the casting. Usually there is more danger of porosity than there is of having too much phosphorus in the solidified casting.

Contact With Water Vapor

Once we have obtained molten metal in a gas-free condition, there are still several points at which it may come into contact with water vapor resulting in the absorption of hydrogen. If we use a transfer ladle, special care must be taken that the ladle lining is absolutely dry. Merely building a wood fire in a newly lined ladle, or using a coke salamander to dry it will not suffice as these methods will leave most of the water of hydration in the lining even though it may appear to be perfectly hot and dry. The use of an oil-air or a gas-air blast flame should be used to provide the final drying and heating to a bright red heat, the latter being necessary to remove all traces of water of crystallization. It should go without saying that the hotter we have the ladle heated before tapping, the less it becomes necessary to heat the metal in the furnace. Even with thorough heating, it appears doubtful if we can remove all moisture from the lining unless holes are provided to permit the steam to pass through the ladle shell.

Assuming that the ladle is dry, some thought should be given to the skimming operation. It is hoped that some one within the near future will determine the exact effect of using a piece of wood as a skimmer. Certainly wood contains a certain proportion of moisture, or compounds which produce moisture upon their decomposition under the influence of heat of the metal. Will the water vapor dissociate to form hydrogen which will be absorbed by the metal? In addition to this question, just what is the effect of the moisture in the air at this period of the operation? Is the tendency to porosity and leakage greater during humid weather than during dry weather?

Eastwood and Kura[4] report tests which indicate that moisture absorbed from the mold may be one of the most important causes of shrinkage porosity, exceeding even the effect of poor melting. Baker, Child and Glaisher'[5] and Pell-Walpole[6] also call attention to the same effect. If this is true and subsequent research confirms these findings, it is evident that much more work must be performed on mold materials before we can hope to obtain absolute soundness. If the metal, on passing through the sprue and gate of an ordinary green sand or dry sand mold or a baked core absorbs moisture which immediately breaks down to form hydrogen and oxygen, we will have to develop entirely new molding methods. Against this idea, however, there always remains the thought that sound castings having no porosity as determined by density and other measurements, have been produced from tin-bronzes poured into green sand molds or against cores containing organic binders, which indicates that we do not yet have all the answers to the questions of gas absorption.

In preventing shrinkage porosity, the following recommendations are offered:

(a) Choose metal for charging which has no gas and is not covered with oil, paint or other gas-forming materials.

(b) Melt in such a manner that no water vapor comes into contact with the metal. This requires an oxidizing flame in a fuel-fired furnace and the avoidance of reducing fluxes or those which contain moisture or water of crystallization. A dry, oxidizing flux will be helpful.

(c) Heat only to the temperature necessary to transfer the metal and pour it at the required temperature.

(d) Deoxidize thoroughly, preferably when tapping from the furnace. When pouring directly from a melting crucible, the deoxidizer must be plunged to the bottom of the pot and thoroughly stirred into the bath.

(e) Pour immediately.

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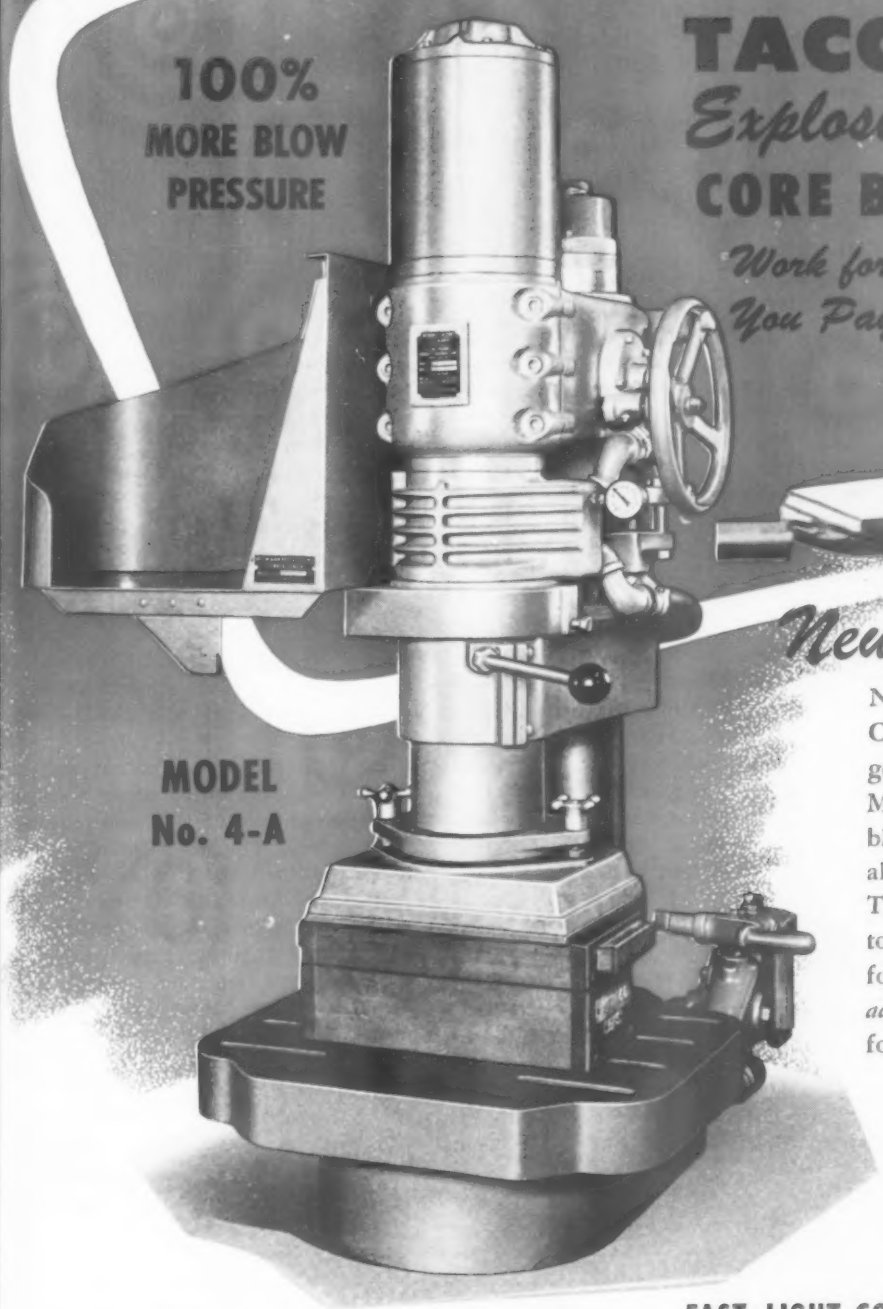

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ACTIVITIES OF FOUNDRY Groups

Chicago

NATIONAL Officers Night of the Chicago Chapter, AFS, was held Nov. 1 with 200 members and guests gathered at the Chicago Bar Association to hear the society's officers describe the scope of the group's activities and Carl Taylor, president, Waukesha State Bank, Waukesha, Wis., deliver an inspiring and thought-provoking address on "America Tomorrow."

Representing the national organization were W. B. Wallis, president, Pittsburgh Lectromelt Furnace Corp., Pittsburgh, AFS president; B. L. Simpson, president, National Engineering Co., Chicago, and S. C. Wasson, manager, National Malleable & Steel Castings Co., Chicago, both national directors; and William W. Maloney, AFS secretary-treasurer. Presiding was Chester K. Faunt, works manager, Christensen & Olsen Foundry Co., Chicago, the chapter president.

Mr. Taylor for the past 12 years has been spending the largest portion of his spare time telling audiences the advantages of the American free enterprise system and depicting the country's steady retreat in recent years from this system.

His sobering analysis of the encroachment that government has made on individual liberties spotlighted his belief that the majority of American people have come to feel that strong government holds the solution to many of the world's ills.

Why great groups have lost faith in the American form of government and the capitalistic system is a question for which there is no ready answer. People who advocate some other type overlook the fact that the marked degree of material, spiritual and cultural progress made by this country in comparison with the rest of the world is the direct result of this system—the American way of life in which every person is free to do whatever he wants with his life and is rewarded proportionately as he does good for other people.

The fear was expressed that this country may soon arrive at "the point of no return," a pilot's term for that spot at which there is no choice but to continue on in the direction of flight because fuel supply is insufficient to permit return to the starting point. How long will it be, Mr. Taylor questioned, before we find that so many of our rights have been entrusted to the government that it will be impossible to reclaim them; we will not be able to return even if we want to. In the last ten years, he declared, mankind has moved further in the direction of enslavement where a few men can tell the group what it must do than mankind had progressed in the opposite direction in the past 500 years.

Speaker at the next chapter meeting Dec. 6 will be George K. Dreher, executive director, Foundry Educational Foundation, Cleveland.—*Howard C. Tuttle.*

CENTRAL ILLINOIS Chapter of the AFS at its first meeting of the season Oct. 4 heard a talk by Frank G. Steinebach, *The Foundry*, shown at right talking with Frank W. Shipley, Caterpillar Tractor Co., chapter chairman

Central Illinois

CENTRAL Illinois Chapter of the AFS held its first meeting of the season Oct. 4 at Jefferson Hotel, Peoria, Ill., with over 100 members and guests present. Frank G. Steinebach, editor, THE FOUNDRY, was the speaker.

Mr. Steinebach opened his remarks by stating three main functions of AFS chapters. The first of these is social; second, educational and third, technical. In his opinion the first two are usually handled capably, but he feels that there is room for improvement in the technical section. He emphasized the need for chapters to make more use of various committee reports of the AFS headquarters.

He went on to say that at the end of the war foundries were stronger in experience and had more facilities than before. The main foundry problems continue to be shortages of manpower and materials. Foundry societies can alleviate the manpower situation by interesting people in foundry work. The foundries, through sound practices, must conserve short materials and hold down costs of castings so that they can compete with other forms of fabrication.

Mr. Steinebach spoke briefly about the National Casting Council which has as one of its main functions the co-ordination of efforts of various branches of the casting industry and keeping problems of the foundry industry before government executives. —*V. W. Swango, Caterpillar Tractor Co.*

Birmingham

APPROXIMATELY 90 members and guests of Birmingham Chapter of the AFS opened the current season at Tutwiler Hotel, Birmingham, Oct. 15. The program included talks by Forbes McKay, associate advertising manager, *Progressive Farmer,* and George K. Dreher, executive director, Foundry Educational Foundation.

Mr. McKay spoke on the subject, "What I Like About the South," and used a number of charts to illustrate

(*Continued on page* 166)

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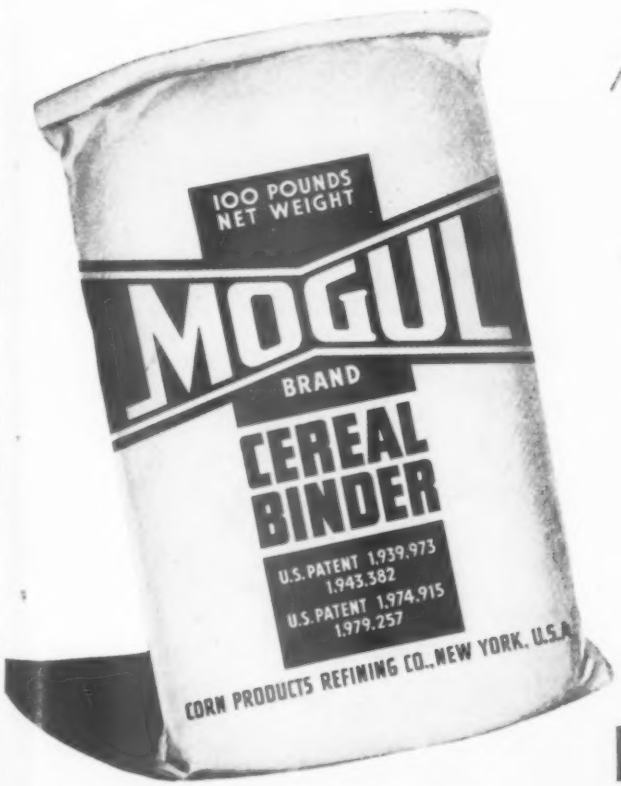

Foundry management, watching mounting costs, sees profits in MOGUL. This perfect Green Bond makes money because it decreases drying time, yields smooth cores and reduces discards. MOGUL works profitably with pitch or resin because cores can be handled warm. For both green and dry strength use MOGUL in cores.

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(*Continued from page* 164)
his presentation.

Mr. Dreher outlined accomplishments of the FEF and stated the objectives of the program: (1) aid six geographically distributed colleges in developing courses of study to prepare young men for the foundry industry, (2) assist the colleges in procuring required foundry equipment, (3) establish scholarships at the colleges, and (4) encourage young men to take the courses.—*J. P. McClendon, Stockham Pipe Fittings Co.*

Northeastern Ohio

APPROXIMATELY 225 members and guests of Northeastern Ohio Chapter of the AFS attended the chapter's regular monthly meeting Oct. 14 at the Tudor Arms Hotel, Cleveland.

Fred J. Pfarr, Lake City Malleable Co., Cleveland, was technical chairman and introduced S. W. Healy and Norman Henke, Central Foundry Division, General Motors Co., Saginaw, Mich., who presented a talk and demonstration entitled "Progress With Better Methods."

In their demonstrations they showed coremaking operations before and after a scientific study of operations. Noticeably improved production with less expended effort resulted from performing the operations in accordance with methods developed through motion studies.

To illustrate the application of these principles in practice in a production foundry, a motion picture showing "before" and "after" operations at the Saginaw plant of Central Foundry Division was shown.

During the question period it was asked if any trouble was encountered when changing from the old method to the new. Do the men complain about making more cores for the same money? Mr. Healy stated that the idea must be sold to the men which, he added, is not too difficult if the adjusted standard represents a fair proposition. He recommended stressing the reduced fatigue factor which accompanies the increased production.

In answer to a question about the scrap rate with the new method, Mr. Healy stated that it improved due to proper controls and uniformity of product. Cores, for instance, are more likely to have uniform qualities when made in the same manner by different employees.

With H. G. Waterfall, Wilbur Pattern Works, presiding, more than 50 pattern-makers and guests listened to an interesting discussion on plaster process match-plates presented by Luke Beinke, Plaster Process Castings Co. He pointed out that master patterns for such work should be carefully finished to prevent plaster from entering crevices and causing trouble in drawing. Coating on wood patterns should be waterproof. Since wax fillets tend to blister under the heat generated during setting of the plaster, leather or plastic fillets should be used. If patterns are of thin section, it is preferable that they be made of metal to prevent distortion.

Mr. Beinke said that it is not necessary for the patternmaker to supply lightening coreboxes since the plaster molder can make them much quicker and cheaper. Information should be supplied on how the patterns are to be gated as well as where bolting lugs and supporting ribs should be located. To amplify his talk Mr. Beinke showed some slides depicting the various steps in making a matchplate by the plaster process.

Pittsburgh

PITTSBURGH Foundrymen's Association's meeting at the Fort Pitt Hotel, Oct. 18, was addressed by W. M. Ball, Jr., consultant and metallurgist for R. Lavin & Sons Inc., Chicago, on the subject of "Essentials of a Good Casting."

Mr. Ball stated that before scheduling production of any casting, the foundryman must determine what

(*Continued on page* 169)

NORTHERN CALIFORNIA Chapter of the AFS held its annual golf tournament and banquet at the Orinda Country Club, Oct. 15

MAKING BETTER BRONZE

-Faster

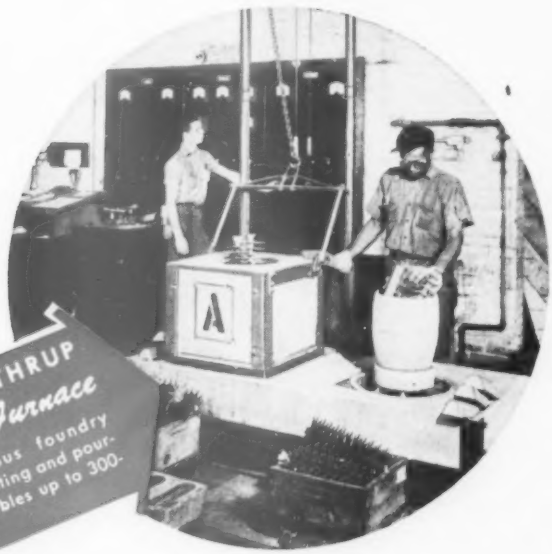
Won't be long now—another 200-lb. crucible of high-tin bronze is about ready to pour from this induction furnace—one of eight Ajax-Northrup units producing up to 17 tons every eight hours in this modern foundry. Every heat is "on the button" with uniform, perfect composition—due to rapid 22-minute melting, close electrical control, electromagnetic stirring, and freedom from oxidation or contamination.

Famed for precision and economy with brass, bronze and other non-ferrous metals, the coil of this furnace fits around a No. 70 crucible, generates heat right in the charge. The furnace never wastes time—while you're pouring and recharging one crucible, it's melting down in another.

Larger furnaces below are tilting units for either non-ferrous or ferrous metals. Each melts 650 lbs. of red brass in 25 minutes with 250-kw. or in 36 minutes with 175-kw. power service. Can be relined quickly for any change-over in alloys. This set-up also includes lift-coil furnace for handling small jobs.

Smaller furnaces down to a few ounces with new trouble-free spark-gap converter power, special furnaces for vacuum casting, centrifugal casting, carbides, etc., and big production furnaces up to 8 tons of steel are also available.

Interested? Why not talk it over with friends who already use Ajax-Northrup furnaces? Or talk it over with us any time. Start today by sending for free bulletins.



AJAX-NORTHRUP
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fits non-ferrous foundry practice of melting and pouring with crucibles up to 300-lb. capacity.

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From 60 lbs. to a ton for non-ferrous melting and up to 8 tons for steel. Easily pours right into molds.

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113

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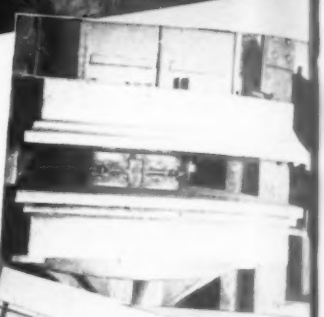
. . . and every step along its huge assembly line, B S & B is meticulous in its effort to provide you with the finest. Welding, hydraulic truing, grinding and drilling of pinlugs (top to bottom) are done by experts. Again and again, each flask is inspected to insure perfect compliance with specifications.



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In these days of delay, you'll be pleased with the speed that B S & B fills your order. Write or wire today for full information. B S & B engineers and planners will be happy to help you with your problems.

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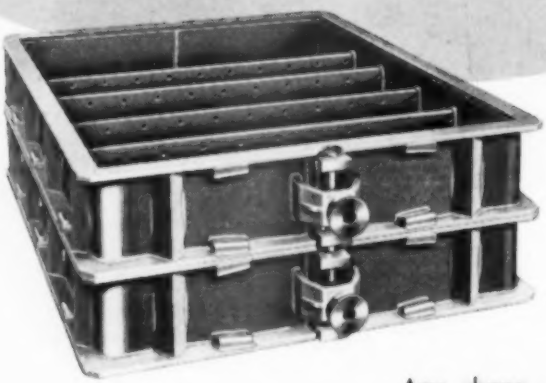

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S. Obermayer Co.

ST. LOUIS, MO.
M. A. Bell Co.
M. W. Warren Coke Co.

TORONTO, CAN.
Canadian Foundry Sup. & Equip. Ltd.

(*Continued from page* 166)
metal is to be used; he must study the behavior pattern; he must know whether or not it is a pressure casting; how many are to be produced, and what is the required rate of delivery. He discussed the various ramifications and pitfalls of each of the following steps in the making of a casting: Pattern equipment, selecting metal or alloy, sand, cores, flasks and molding, melting, shakeout, finishing and cost.

Each step along the way Mr. Ball cited a practical example or illustration which he had encountered. His talk contained a great deal of practical information. Discussion following the talk covered a wide variety of subjects and was led by William J. Laird, Westinghouse Electric Corp.—*Joseph C. Sullivan.*

No. Illinois and So. Wisconsin

NORTHERN Illinois and Southern Wisconsin Chapter of the AFS met Oct. 12 at the Senate Hotel, Freeport, Ill., with approximately 90 members and guests present. J. A. Gitzen, president, Delta Oil Products Co., Milwaukee, spoke on "The Chemical, Physical and Mechanical Properties of Binders in Cores and Molds."

He classified binders into groups and outlined the purpose of each group, its history and the development of new methods to meet the continually changing problems that confront the foundry industry.

Prior to the meeting, Arcade Mfg. Division of Rockwell Mfg. Co., Burgess-Parr Co., Fairbanks Morse & Co. and Woodmanse Mfg. Co., all of Freeport, opened their foundries to visitors under arrangements made by Bruce Whiting, Woodmanse Mfg. Co. —*Upton E. Bartlett.*

New Jersey

H. L. EDINGER, Barnett Foundry & Machine Co., Irvington, N. J., has been elected president of the New Jersey Foundrymen's Association, succeeding Max Traum, Sacks-Barlow Foundries Inc., Newark, N. J. E. B. Smith, American Brake Shoe Co., New York, has been named vice president and J. A. Williamson and John L. Carter, both of Newark, have been re-elected treasurer and secretary, respectively.

Newly elected directors are J. R. Campbell, Campbell Foundry Co., Harrison, N. J.; M. J. Hogan, Beirman-Everett Foundry Co., Irvington; J. C. Phelan, Benjamin Eastwood Co., Paterson, N. J.; Philip R. Van Duyne, Meeker Foundry Co., Newark; A. E. Winstead, Moore Bros. Co., Elizabeth, N. J.; and H. L. Edinger.

Elections were held in connection with the association's first fall meeting at the Military Park Hotel, Newark, Oct. 11, a meeting that was also featured by an address by A. W. Gregg, executive engineer, Whiting Corp., Harvey, Ill., on the subject of "Cupola and Yard Layout and Equipment."

In combating present high labor costs, the speaker said that one of the most appropriate problems to tackle first is this matter of layout and equipment. However, such costs, Mr. Gregg said, are not the only consideration, for important benefits are to be had from increased output, reduction of scrap and improved working conditions which make it possible to attract better class of labor.

He discussed particularly various types of charging equipment, showing slides and describing each type in broad detail. In his opinion, the skip hoist is the most appropriate for small foundries.—*Ben K. Price.*

Central Ohio

NINETY-ONE members and guests of the Central Ohio Chapter of the AFS attended the Oct. 11 meeting at Chittenden Hotel, Columbus, O. Ralph L. Lee, department of public relations, General Motors Co., was the principal speaker.

In commenting upon his visit to Battelle Memorial Institute during the afternoon, Mr. Lee pointed out that science has developed a tremendous array of instrumentation to determine facts regarding physical, chemical and mechanical behavior. In spite of this imposing array, science has been unable to develop similar instrumentation to measure human behavior.

Mr. Lee presented four observa-

CENTRAL INDIANA: Views of the Oct. 4 meeting of Central Indiana Chapter of the AFS are shown above. At top Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Indianapolis, and chapter chairman, is shown at the microphone. Speaker for the evening, Ford R. Snyder, Hickman, Williams & Co., Chicago, is shown in the center view, addressing the group. Photos are by courtesy of International Harvester Co., Indianapolis

tions on human behavior which he says should be the basis for relations among people: (1) Every human is different from every other human; therefore, it is impossible to treat people on a mass production basis. (2) People are what they are because they usually cannot change as much as they would like to; therefore, they must be helped to adapt themselves to existing conditions. (3) No person acts the same all the time; unusual conditions have an effect upon his behavior at any given time. (4) Every human is proud of the inherent differences in his makeup that set him apart from others; this pride usually results in a fear of being ignored.—*H. W. Lownie Jr., Battelle Memorial Institute.*

Western New York

FIRST fall meeting of Western New York Chapter of the AFS was held at Hotel Sheraton, Buffalo, Oct. 1, with 152 members and guests present. The principal speaker was Edwin J. Schwanhausser, vice president, Worthington Pump & Machinery Corp., Harrison, N. J.

Mr. Schwanhausser surveyed conditions in a number of basic industries and stated that he does not expect a serious recession in production activity for several years. In giving the short-range view, Mr. Schwanhausser said his judgment is that we are reaching a leveling off or readjustment period, but that things will move sideways rather than backwards.—*Roger E. Walsh, Hickman, Williams & Co.*

Northwestern Pennsylvania

NORTHWESTERN Pennsylvania Chapter of the AFS held its first dinner meeting of the current season Sept. 27 at the Moose Club, Erie, Pa. E. F. Kindt, vice president, Kindt-Collins Co., Cleveland, spoke on patternmaking as it concerns the foundry. He provoked a lively question-and-answer session.

Coffee speaker for the evening was Clarence McKinney who spoke on "Our Unseen Enemy, the Communist." He was very forceful in his condemnation of the communists and offered several suggestions on how to combat their efforts.

This season's officers and directors were introduced. They are: Chairman, Joseph S. Hornstein, Meadville Malleable Iron Co.; vice chairman, Joseph A. Shuffstall, National Erie Corp.; secretary, R. J. Harding, Pickands Mather & Co. and treasurer, Frank P. Volgstadt, Griswold Mfg. Co.

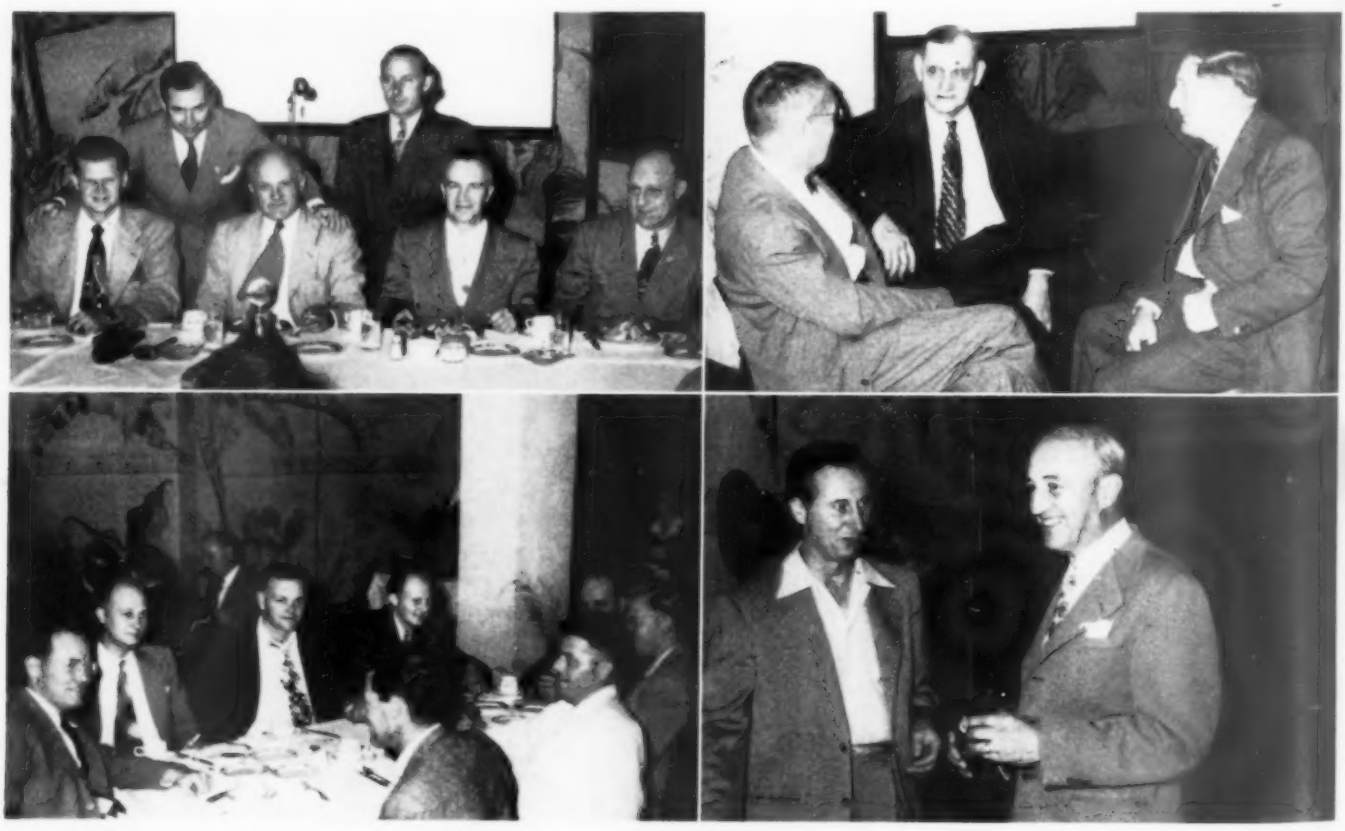
Directors are: George Johnstone Jr., Johnstone Foundries Inc.; J. Douglas James, Cooper-Bessemer Corp.; John E. Gill, Lake Shore Pattern Works; James J. Farina, American Sterilizer Co.; Bailey D. Herrington, Hickman, Williams & Co.; Fred J. Carlson, Weil McLain Co.; J. Marcus Morrison, U. S. Radiator Corp.; Clyde E. Cooper, Keystone Brass Works; Harold G. Lolley, Bucyrus-Erie Co. and John W. Clarke, General Electric Co.—*James J. Farina, American Sterilizer Co.*

Southern California

CLYDE A. SANDERS, American Colloid Co., Chicago, addressed the Southern California Chapter of the AFS at its October meeting. His talk dealt mainly with foundry sands.

He stated that loosely packed sand forms an insulator around the casting, whereas closely packed sand conducts heat rapidly. Sand with particles all the same size has the

(*Continued on page* 172)



SOUTHERN CALIFORNIA: Views of the Oct. 8 meeting of Southern California Chapter of the AFS are shown here. Shown at the speakers' table, upper left, left to right, are: Clyde A. Sanders, American Colloid Co., Chicago, speaker; John E. Wilson, Climax Molybdenum Co., chapter secretary; Leonard O. Hofstetter, Brumley-Donaldson Co., chapter chairman; Earle D. Shomaker, Kay-Brunner Steel Products Inc., chapter vice chairman; Joseph C. Meyer, Snyder Foundry Co., membership chairman, and William D. Emmett, Los Angeles Steel Casting Co.

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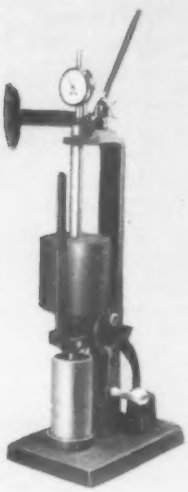
SAND

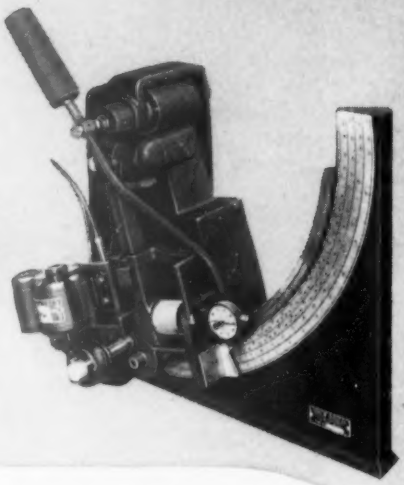
MOISTURE TELLER an instrument for either plant or laboratory which flash-dries sand samples for accurate moisture determination.

SAND RAMMER accurately reproduces the ramming of specimens to be tested for permeability, strength, density and flowability.



PERMMETER quickly and precisely determines the A.F.A. standard permeability of all molding materials. A direct reading unit.

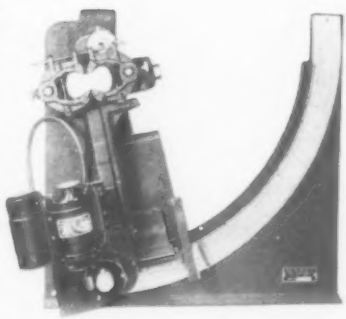
SAND STRENGTH MACHINE determines green or dry compression and shear strength of sand—also deformation to determine plastic strength. It is either indicating or recording.



CORES

BAKING OVEN provides accurate control of core baking for core research and binder testing.

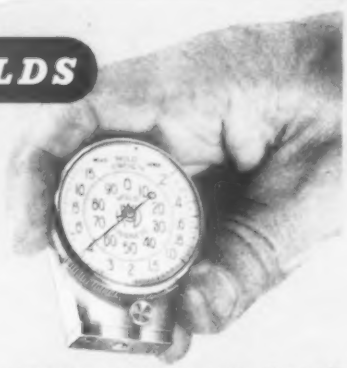
CORE PERMEABILITY TUBE is used with the Permmeter to determine the A.F.A. Permeability of baked cores and dried specimens.



TENSILE CORE STRENGTH ACCESSORY attached to the Sand Strength machine determines tensile strength of baked core specimens.

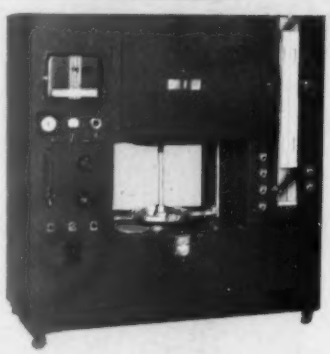
GAS DETERMINATOR measures volume of gas released by any core or molding sand mixture—used also to check baking practice.

MOLDS



MOLD HARDNESS TESTER determines hardness of green sand molds or green cores—also compressive strength of mold surface in psi.

CORE HARDNESS TESTER measures surface hardness of baked cores and dry sand molds.



DILATOMETER: a complete high temperature testing laboratory. Predicts behavior of sand and core during pouring, solidification and shakeout.

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(*Continued from page* 170)

same effect as loosely packed sand. He added that the proper blending of the correct size sand grains is as important as moisture control if rat tails and other casting defects are to be minimized.

In commenting on mechanization, he stated that if a plant is to be mechanized it should be done throughout because one old machine is likely to form a bottleneck. He advised against letting old-time foundrymen work on new machines because they are wedded to old methods and cannot respect the possibilities of new machines.

Chapter President Leonard O. Hofstetter, Brumley-Donaldson Co., Los Angeles, announced that courses in "Fundamentals of Foundry Practice and Operations," are underway at Huntington Park High School with Joseph A. Burgard as instructor. The program will continue until mid-January.—*Maurice Beam.*

Detroit

IN an endeavor to acquaint the public with the contribution made by the foundry industry to local civic and industrial life, the Detroit Chapter of the AFS has set up a three-man educational committee.

The committee is headed by Jess Toth, secretary, Harry W. Dietert Co. Other members of the committee are L. Carl Beers, sales manager, and A. S. Lundy, chief engineer, the Claude B. Schneible Co.

Twin City

NEARLY 100 members and guests of Twin City Chapter of the AFS met Oct. 7 at the Covered Wagon, Minneapolis, to hear Frank G. Steinebach, editor, THE FOUNDRY, discuss trends in the foundry industry. Sheldon V. Wood, past AFS national president and an active member of the Twin City Chapter, introduced the speaker.

Mr. Steinebach stressed the necessity for every foundry to keep costs to a minimum level. If foundry costs get much higher, substitutes will rapidly encroach upon the foundry business. He went on to say that increased attention to production control in an effort to produce uniform castings is important if foundrymen are to have satisfied customers willing to continue to do business with the casting industry.

The speaker traced the growth of the industry from the beginning of the recent war to the present. He stated that the war stimulated foundries in modernization and mechanization, in the pursuit and attainment of technical knowledge and in a great deal of co-operative effort. In his opinion, we are just on the threshold of foundry development, despite the

(*Continued on page* 174)

CENTRAL INDIANA Chapter of the AFS held its annual picnic Sept. 25 at Lakeshore Country Club, Indianapolis. Views of the picnic are shown above. Photos are by courtesy of staff photographer, International Harvester Co., Indianapolis

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Glamour on the beach is one thing. Glamour in a product, which is the result of better engineering, is something else.

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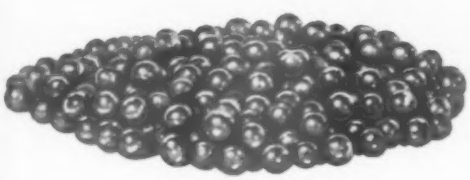

ANNEALSHOT by *Metal Blast*

Trade Mark Reg. U. S. Pat. Off.

(*Continued from page* 172)

"push-button" foundries which are being constructed today. — *O. J. Myers, Werner G. Smith Co.*

Texas

RECENT Developments in Foundry Refractories" was the subject of a paper by James H. Rickey Jr., production engineer, Ironton Fire Brick Co., Ironton, O., presented before the Texas Chapter of the AFS Oct. 15 at Texas State Hotel, Houston, Tex.

Mr. Rickey stressed the necessity for proper installation, prefiring, and operational use of refractories to obtain maximum service. He described recommended methods of lining cupolas, ladles and electric furnaces with brick and monolithic type linings.

First meeting of the Texas A. & M. Student Chapter of the AFS was held in the Engineering building at A. & M. College, Oct. 12. M. W. Williams, foundry manager, Hughes Tool Co., Houston, spoke to the professors, students and guests on "Opportunities in the American Foundrymen's Society and the Foundry Industry."

The chapter entertained its guests with coffee and doughnuts, following the talk, and the enthusiasm of the students, as well as their interest in the foundry industry, was evident in the spirited question and answer session.

Officers of this student chapter are: Chairman, John A. Whitacre; vice chairman, B. D. Stone; treasurer, Clyde C. Sproggins, and secretary, Victor C. Hendell. Faculty adviser is Lloyd G. Berryman, associate professor, and the industrial adviser is Malcolm J. Henley, chief metallurgist, Texas Foundries, Lufkin, Tex.— *W. H. Lyne, Hughes Tool Co.*

Tennessee

TENNESSEE Chapter of the AFS heard C. A. Brashares, district sales manager, Harbison-Walker Refractories Co., discuss "Cupola Refractories" at Hotel Patten, Chattanooga, Tenn., Oct. 22.

Mr. Brashares described three methods of making fire brick—the extruded method, power press method and hand method. Materials used in the refractories are flint clay, a very hard and strong clay with high fusion point; calcine or pre-burned clay (grog) and plastic clay, which is the bonding material.

In the extruded method the mix is forced through the extrusion machine by steam and as it comes out it is cut by wires into clots roughly to size. The clots are tempered on hot floor and put into forming machines for forming and shaping.

In the power press process the mix is placed in forms and compressed at 4000 to 5000 psi to form the brick. In the hand made method the mix is thrown mechanically into molds and then placed on hot floor for tempering.

Mr. Brashares concluded by discussing some so-called refractory "failures." — *Carl A. Fischer Jr., Equipment & Supply Co.*

Saginaw Valley

APPROXIMATELY 176 members and guests attended the first meeting of the season held by Saginaw Valley Chapter of the AFS, Oct. 7, at Fisher Hotel, Frankenmuth, Mich. The speaker was L. E. Everett, Lester B. Knight & Associates Inc., Chicago.

Mr. Everett's topic was "Foundry Modernization," and he emphasized that modernization does not mean mechanization, which is only one phase of modernization. He divided his talk into three parts: Management and organization, quality for successful profits, and facilities. He dealt with each division at length and stated that he placed management and organization ahead of facilities because the foundry industry, in his opinion, is still an art and not a science.

Donald D. Bowman, Almont Mfg. Co., Imaly City, Mich., was technical chairman. — *Kenneth H. Priestley, Vassar Electroloy Products Inc.*

SAGINAW VALLEY Chapter of the AFS held its first meeting of the season Oct. 7 at the Fisher Hotel, Frankenmuth, Mich. A section of the speakers' table is shown in the top view. Left to right are: Donald D. Bowman, Almont Mfg. Co., Imlay City, Mich., technical chairman; L. E. Everett, Lester B. Knight & Associates Inc., Chicago, speaker, and Oscar E. Sundstedt, General Foundry & Mfg. Co., Flint, Mich., chapter chairman

Rochester

ROCHESTER Chapter of the AFS held its first meeting of the season at Hotel Seneca, Rochester, N. Y., Oct. 12. L. P. Robinson, Werner G. Smith Co., spoke on "Cutting Costs in the Coreroom."

Mr. Robinson stressed sand, measuring, mixing and baking as fundamentals in cutting core costs. He stated that although a core can be made with any sand, a good core re-

(*Concluded on page* 176)

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Completely mechanized sand preparation

Here is the machine that foundries have been waiting for—the machine that does the entire sand preparation job mechanically. Hand shovelling is a thing of the past. Loading is automatic. So are the operations of trash rejection, blending, combing, degassing and aerating. You can get up to 50 tons per hour of evenly textured sand—perfect for smooth faced castings. Sand preparation costs are down to a minimum in foundries equipped with the new Self Loading Royer.

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(*Concluded from page* 174)

quires sand free from clay and organic matter. Employment of the least skilled and the least intelligent help to prepare core mixtures and use of battered and crushed measuring containers are costly practices.

He went on to say that the proper mixing sequence and cycle should be determined and adhered to for maximum uniformity and economy. In conclusion he said that baking gives more trouble than other factors. Difficulties arise primarily from baking at incorrect temperatures and use of ovens having poor heat distribution.

Slides and movies taken at the annual picnic held in September were shown.—*G. M. Etherington, Gleason Works.*

Central New York

CENTRAL New York Chapter of the AFS met at the Mark Twain Hotel, Elmira, N. Y., Oct. 15, with 125 members and guests present to hear a talk by Harry Dietert, Harry W. Dietert Co., Detroit.

With the use of a two-reel moving picture entitled "Mold Atmosphere," Mr. Dietert showed various stages of "burning in" at several different metal temperatures. Then, by introducing gases into the mold cavity or, as he called it, "facing the mold with gas," this penetration was either eliminated entirely or reduced considerably.

He also showed a series of slide pictures of "rat-tails" and means used to prevent them. He proved that mold hardness and sand permeability have direct bearing on "rat-tail" defects and that the establishment of controls will do much to overcome this particular casting defect.

Mr. Dietert concluded by discussing the problems of the AFS sand committee and the work that the committee is doing.—*John A. Feola, Crouse Hinds Co.*

Chesapeake

NORFOLK Navy Yard played host to the AFS Chesapeake Chapter on Sept. 24. Over 50 members traveled to Portsmouth and were well rewarded by an interesting day-long visit in the foundry.

Stanley Brinson, the master molder, personally conducted a detailed inspection of the foundry facilities. Sand handling is completely mechanized. The foundry makes both ferrous and nonferrous parts for the ships being constructed or repaired in the yard. After lunch, the group was privileged with an awe-inspiring tour of the *Midway*, one of the largest aircraft carriers afloat. Special buses then carried the group throughout the yard and along the waterfront to view the inactivated "moth-ball" fleet.

The evening session was held in Norfolk and began with a fine dinner enjoyed by over 70 members and visitors. Stanley Brinson aided our digestion with one of his inimitable humorous after-dinner talks. In a more serious vein, J. A. Duma addressed the group on the subject of "Practical Hints on Melting Brasses and Bronzes." In his talk, the speaker advised melting under a slightly oxidizing atmosphere, pouring each alloy at its optimum temperature, cautioned against hydrogen contamination, and described a unique test for rapid determination of zinc additions by measuring specific gravity.—*Jack H. Schaum, National Bureau of Standards.*

MICHIGAN FOUNDRY CONFERENCE: View of a section of the speakers' table at a dinner held in connection with the recent Michigan Foundry Conference at Michigan State College, East Lansing, Mich. Left to right, are: Joseph Foster, technical assistant, AFS; Edwin W. Horlebein, national AFS vice president, and Dean L. G. Miller, MSC Engineering School

NEW ENGLAND HOLDS EIGHTH CONFERENCE

(*Continued from page* 118)

must know the answers or willingly admit that he doesn't, and he must be able to keep his emotions under control—not becoming excited or irritated when things go askew.

At the third technical session, under the direction of Chairman Henry G. Stenberg, Draper Corp., Hopedale, Mass., speakers were L. P. Robinson, Werner G. Smith Co., Cleveland, and James S. Vanick, International Nickel Co. Inc., New York. Mr. Robinson's talk was concerned with "Cost Reduction Practice in the Core Room," and he stated that while it is possible to make a core from any type of sand, selection of a suitable sand results in use of less binder, and less defective castings. For example, one foundry saved $8000 a year and another $28,000 by changing from a poor sand to a good one. He pointed out that measuring equipment for sand and binders should provide reproduceable results, and be kept in good condition.

Intelligent help should handle the mixing of sand and binder so that consistent results will be obtained. Proper core mixtures should be determined by experiment, and then their compounding checked regularly to see that no changes have been made without authority. Mr. Robinson pointed out that from ½ to 1 per cent cereal binder is sufficient to provide green strength in oil bonded sands, and that for every core mixture there is a suitable mulling or mixing time. The latter is determined by experiment, and to maintain the correct cycle an automatic timer should be attached to the machine. High moisture in cores slows up baking, causes cracked cores, and results in reduced tensile strength. Cores should be baked at the proper temperature range for sufficient time in core ovens which maintain uniform temperatures in all parts.

Mr. Vanick discussed the "Foundry Industry and Its Future," stating that annual gray iron casting production now is around 12,500,000

tons; steel castings about 1,600,000 tons; malleable iron around 1,000,000 tons; aluminum and brass castings approximately 300,000 tons each, and heat and corrosion resisting castings about 20,000 tons. He said that he believed there would be an increase in available labor due to improvement in working conditions and in wages. Mechanization is increasing, and the development of automatic molding equipment will increase production. It appears that the pig iron situation may improve due to blast furnaces down for repairs being put back into blast, and the coke supply will be satisfactory unless demand should increase.

He said that studies are being conducted in various quarters with a view to improve castings, these involving grain size in gray iron and brass castings, heat treatment, application of alkaline earths, cerium, magnesium, selenium, boron, tellurium, aluminum, as well as the widely used alloying agents. Investigations also are being conducted on gating and risering of castings to provide greater soundness and obtain higher yields. Encroachments on castings include use of the stamping process for bathtubs and sinks, powdered metals and alloys, and ceramic materials for heat-resistant applications.

Explains Pig Iron Situation

Annual conference dinner was held Friday night at the Graduate House, M. I. T., Arthur F. Dockry presided and speakers were Dr. John Chipman, M. I. T., and William B. Wallis, national president, American Foundrymen's Society. "Bumps" Hadley, radio sportcaster, station WBZ, Boston, presented some interesting highlights on baseball.

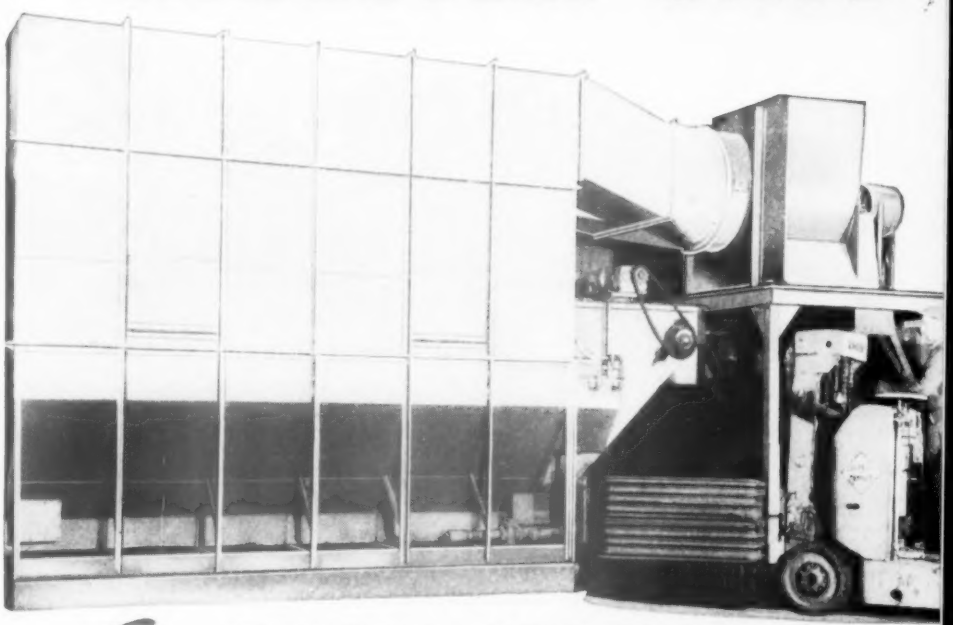
Opening technical session Saturday morning was under the direction of R. F. Harrington, Hunt-Spiller Mfg. Corp., South Boston, Mass. First speaker was R. P. Tibolt, Mystic Iron Works, Boston, whose topic was "Pig Iron—Future Supplies" and which dealt primarily with the situation in New England. He said that one of the factors in the present shortage of pig iron is that the product of some 50 blast furnaces in eastern Pennsylvania and Virginia no longer is available due either to dismantling, change in sales territory, etc. Another is the closing down of numerous furnaces for repair while a third factor is the shortage of steel scrap which results in open-hearth operators using more pig iron for steelmaking. Poor quality coke also has reduced the amount of pig iron that can be produced.

(*Continued on page* 180)

Announcing

THE BEST INVESTMENT IN DIRT AND DUST CONTROL EQUIPMENT YOU CAN MAKE!

Schmieg NEW all *Stainless Steel* ARRESTER UNIT



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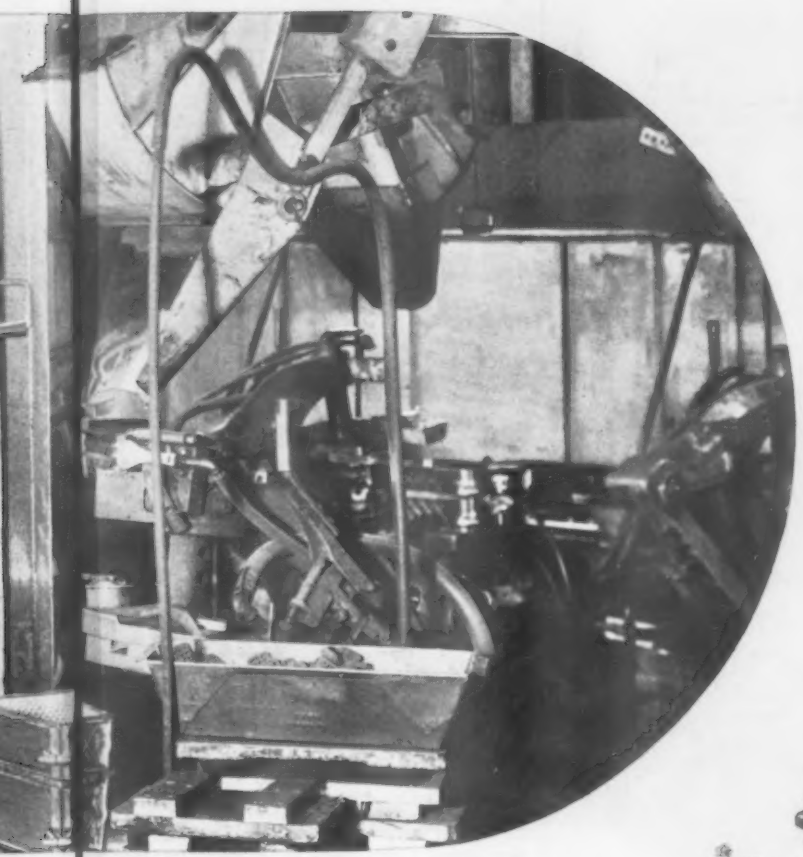
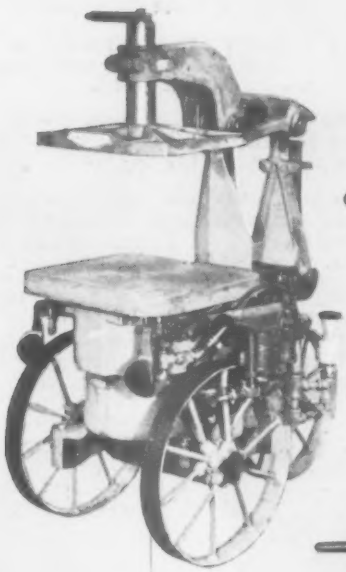
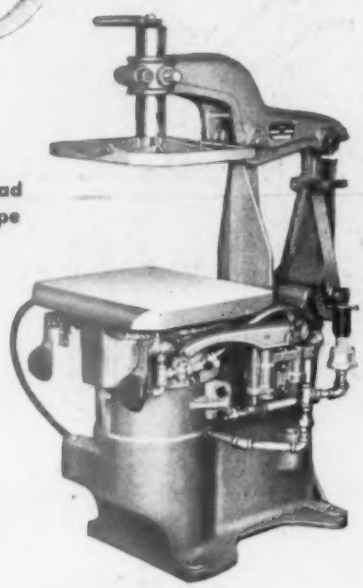
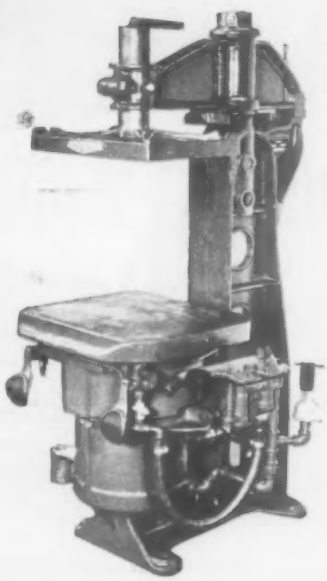




Cantilever Head
Portable Type



Cantilever Head
Stationary Type



Stationary
Post Type

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On all models performance records are evidence of their high quality. You will find the name Schramm written on every important page in compressor history.

Features you get in Schramm are: 100% water cooled, assuring ideal performance summer and winter; mechanical intake valve, forced feed lubrication. All Schramms are compact, lightweight, easy to operate.

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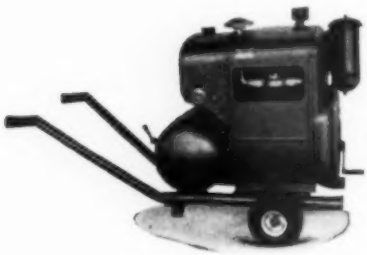
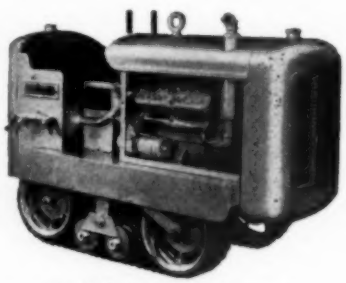
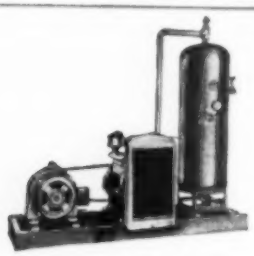


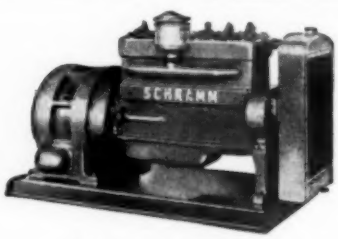
No. 20 Compressor on Shop Truck



No. 60 Self-Propelled Compressor

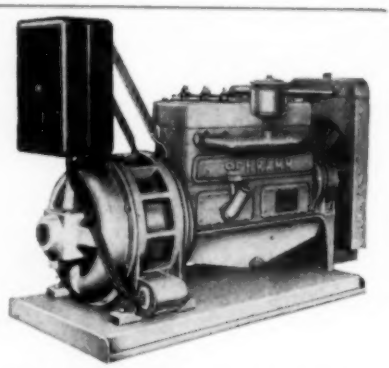


V-Belt Drive with Cooling Unit



Built-in Motor with Cooling Unit

"V" Belt on Flat Pulley Drive



Built-in Motor Drive with Cooling Unit and Starter

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PENNSYLVANIA

(Continued from page 177)

In Mr. Tibolt's opinion the pig iron situation will improve slightly as furnaces are put back into blast, but there will be a shortage until more scrap is available, or until demand for steel or for foundry products declines.

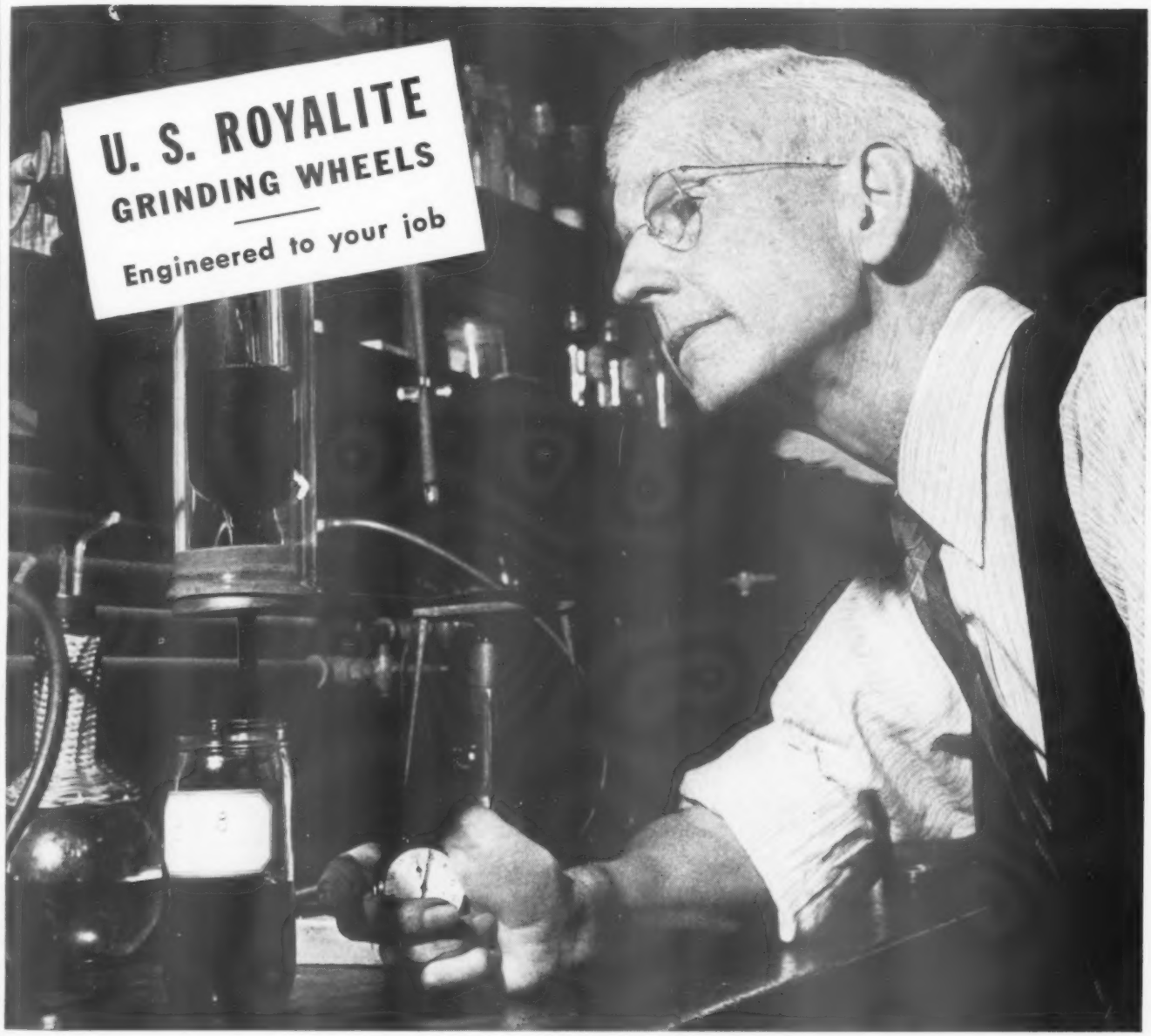
Second speaker was R. G. McElwee, Vanadium Corp. of America, Detroit, who discussed "Production of Cast Iron—Making the Most of What Is Available." He said there is a tendency for foundries to collect information such as chemical compositions and mechanical properties of irons, molding and core sand characteristics, etc., which are filed instead of being put to use. For example, analysis of iron from the cupola three times a day will not be of much value, but one taken every half-hour will indicate the changes taking place through the heat. From that changes can be made in coke, etc. during the heat or on the next heat to provide more uniform melting and composition of the iron. One foundry found that better distribution of the iron charges on the bed and succeeding coke splits amply repaid the extra work involved. Better results have been obtained in cupola operation by screening the coke and throwing away the fines.

Fines Are Briquetted

At Pontiac Foundry of General Motors Corp., coke is screened to 1½-in. size, and material below that is briquetted with 6 per cent Portland cement and used in the cupola up to 30 per cent. Some foundries are using up to 50 per cent anthracite in the coke splits to bolster poor quality coke. Mr. McElwee said he believes that for many purposes better castings could be secured by using high-carbon irons which have a narrower plastic or mushy range during cooling, and shrink less than low carbon irons. Increase in carbon content can be obtained by charging a lower silicon content in the cupola, increasing the bed, and using somewhat larger coke splits. He also said that attention to slag composition gives good results. Slags that are too basic are viscous, and this condition can be corrected by addition of siliceous material.

Second and concluding technical session was presided over by Dr. Walter M. Saunders, Providence, R. I., and the speakers were A. H. Hesse, R. Lavin & Sons, Chicago, and Prof. Howard F. Taylor, M.I.T. In discussing outstanding developments in the nonferrous field Mr. Hesse said that the use of insulating sleeves on

(Concluded on page 182)



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Standard
GRAVITY & POWER
CONVEYORS

(*Concluded from page* 180)

sprues and risers permits considerable reduction in the quantity of metal required to pour a given casting. In some cases the amount in sprue and riser is only 30 per cent of that used when sleeves are not employed. Sleeves made from ordinary casting plaster require a high burnout temperature, and should be used shortly after that operation to prevent trouble from moisture pickup. However, a new type of plaster is said to be more permeable, burns out at a much lower temperature, and is not so critical relative to the use period.

Sand Has Reduced Bond

Mr. Hesse said a study has indicated that the rough surface on castings often is due to the bond in the sand being burned out, permitting the sand to wash ahead of the metal stream. Application of the principles of directional solidification by use of chills, insulating sleeves, etc., should be given more attention. Use of exothermic materials placed on the riser after it is filled with metal also is beneficial as it increases the metal temperature and keeps it fluid. He said that application of superheat and suitable deoxidation to 85-5-5-5 alloy gives excellent mechanical properties. In one procedure, superheating to 2460°F and cooling to 2170°F for pouring showed a tensile strength of 39,500 psi, and an elongation of 39.5 per cent. Ingot was placed in a red-hot crucible with the furnace atmosphere containing 1 per cent O_2, and deoxidized with 2 per cent Zn and 1½ oz phosphor-copper.

Prof. Taylor gave a brief resume of the Foundry Educational Foundation progress at M.I.T., indicating that eight to ten students will be obtaining bachelor of science degrees, five to six studying for master of science degrees, and four working on doctor of science degrees on scholarship grants. He also pointed out that the institute provides the training in fundamentals of physics, chemistry and mathematics which can be applied to the foundry field, with a brief study of the basic foundry processes. Details of operating foundry techniques must be taught by the foundries where the student may work in summer vacations, or after graduation. Courses tied in with the Foundry Educational Foundation's work include those of mechanical engineering, metallurgical engineering and business and engineering administration.

The two-day conference ended with a smoker sponsored by foundry supply firms in the New England district and held at the Parker House.

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LENGTHENS FURNACE LIFE-SPAN

YOU can depend on longer life with more tonnage per day from a furnace lined with Robinson Silica Brick. There are good reasons why it withstands long, hard service under extreme conditions of furnace operation! High quality ganister is selected for the minimum of harmful impurities before processing. Very low alumina content insures maximum strength at high temperatures. Modern manufacturing methods impart extreme density and high resistance to spalling and slagging. Strict laboratory control in all phases of manufacture keeps quality at a *uniform* high for longer life and better service! Robinson FRC Silica Brick saves you money by decreasing brick consumption and cutting rebuilding costs! For *dependable* furnace performance, it's Robinson Silica Brick — one of the Robinson line of *uniform* refractories!

Write For Your Free Copy Of The Robinson Refractories Catalog You'll find information in it that you'll use all the time. Just drop a line to The Robinson Clay Product Co., Akron 9, Ohio and we'll mail your copy immediately.

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Robinson Engineered Refractories: Silica Brick, Fire Brick, High-Temperature Bonding Mortar, Castable Refractories, Plastic Fire Brick, Acid-Proof Cement, Fire Clays, Super-Duty Plastics.

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The 1949 Exposition will be held in Philadelphia January 10 through 14 and will constitute a broad view and preview of "industrial history in the making." It will be the most convincing demonstration of all time that the Science of Materials Handling is eternally new—that it is a never-ending process of evolving new and better methods and equipment to the end that our National economy can shake off the shackles of old, inefficient and time-consuming practices which have become prohibitively costly both in human energy and in dollars.

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OBITUARY

EDWARD N. BROUGH, 66, formerly superintendent of the foundry and pattern shops at the St. Johnsbury, Vt., plant of Fairbanks, Morse & Co., Chicago, died Oct. 24, at his home in St. Johnsbury. Mr. Brough, a native of Grand Haven, Mich., joined the Sheffield Car Co., Three Rivers, Mich., as a journeyman patternmaker around 1900. In 1916, Fairbanks, Morse & Co. sent him to St. Johnsbury as superintendent of the foundry and pattern shops. Upon his retirement there in 1946, he became consulting engineer for Howe Scale Co., Rutland, Vt. Mr. Brough was a member of the New England Foundrymen's Association and the American Foundrymen's Society. An authority on foundry problems, he had frequently addressed technical groups at AFS conventions and conferences.

* * *

Theodore M. Dubs, 71, president and manager, Canton Pattern & Mfg. Co., and president, Canton Stoker Corp., Canton, O., died Oct. 17. Mr. Dubs was born in Alsace Lorraine and was apprenticed as a patternmaker there before going to Canton at the age of 17. In 1910 he formed a partnership with W. W. Arnold and started the pattern shop, which changed hands many times and finally became the Canton Pattern & Mfg. Co. in 1920. Mr. Dubs acquired the stoker company in 1940. He was a member of the American Foundrymen's Society.

* * *

John N. Sumner, 46, who has been associated with the Foundry Division of the Eaton Mfg. Co., Vassar, Mich., since 1934, died recently. Mr. Sumner was born in St. Thomas, Ont., and following graduation from high school went to Detroit in 1919, where he became an apprentice patternmaker at Locke Pattern Co. Later he was associated with Dodge, Ford and Oakland Motor companies, Detroit, as a skilled pattern engineer, specializing in permanent mold design and production pattern equipment.

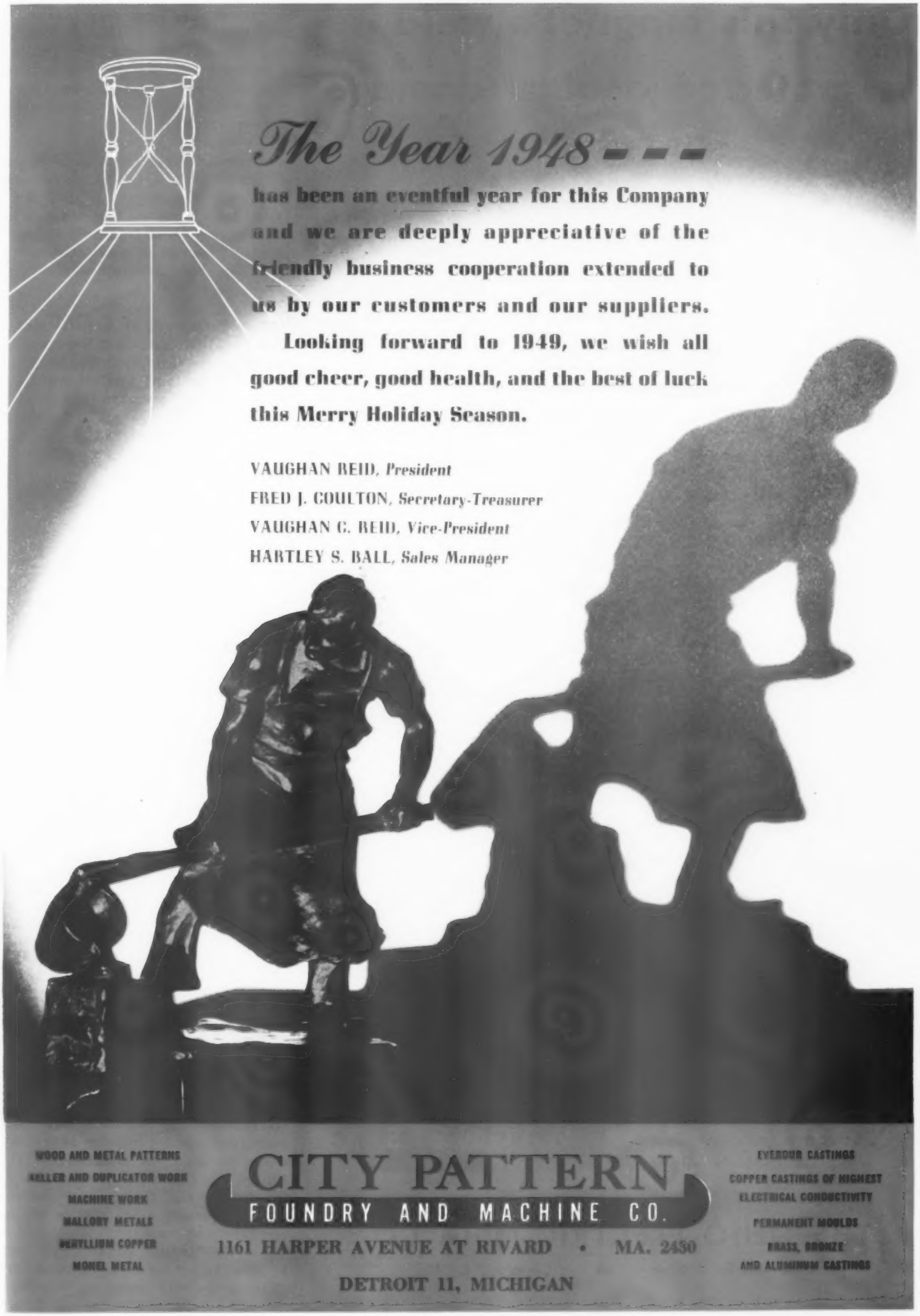
* * *

John Carson, 67, foundry foreman, Fort Pitt Malleable Iron Co., McKees Rocks, Pa., died Oct. 27, at his home in Morningside, Pa. Mr. Carson had been associated with the iron company for 43 years.

* * *

Randolph Simpson, 62, for the last 28 years in charge of the metallurgical and melting departments, Elec-

(*Concluded on page* 186)



The Year 1948 - - -

has been an eventful year for this Company and we are deeply appreciative of the friendly business cooperation extended to us by our customers and our suppliers.

Looking forward to 1949, we wish all good cheer, good health, and the best of luck this Merry Holiday Season.

VAUGHAN REID, *President*
FRED J. COULTON, *Secretary-Treasurer*
VAUGHAN C. REID, *Vice-President*
HARTLEY S. BALL, *Sales Manager*

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PROTECTO-WELD magnets are built for efficient, dependable operation on your toughest jobs. Copper coils are heavier-duty with plenty of non-cracking asphaltum insulation. Ohio Magnets operate cooler over extended periods ...lift larger loads *allday long.*

Four sizes of Ohio PROTECTO-WELD magnets are now in production: 39, 46, 55 and 65-inches in diameter. Besides 4-coil types, there are also 6 and 8-coil magnets for that extra Ohio lifting strength. For details, write today to Ohio — *25 years a leader in magnetic materials handling.*

Ohio is also a leading name in the small motor industry

Ohio MAGNETS

THE OHIO ELECTRIC MFG. CO.

5910 Maurice Avenue • Cleveland 4, Ohio

(*Concluded from page* 184)

tric Steel Foundry Co., Portland, Oreg., died at his home there Oct. 9. A native of Cambridge, Mass., Mr. Simpson was graduated from Dartmouth College and had lived in Portland since 1912.

* * *

James L. Hegarty, 52, a foreman at the Granite City, Ill., plant of American Steel Foundries, died Oct. 11, at his home in that city. Mr. Hegarty, who was born in Jacksonville, Ill., had been associated with American Steel Foundries for the last 24 years.

* * *

Ernest Bancroft, 41, general manager, Floyd-Wells Co., Royersford, Pa., died suddenly Oct. 20, in Chicago. Mr. Bancroft was president of the Stove Builders' Association.

* * *

Thomas F. Maher, 82, president, Jamestown Iron Works Co., Jamestown, N. Y., died Oct. 1.

* * *

Benjamin H. Clement, 73, president, Rochester-Erie Foundry Corp., Rochester, N. Y., died Aug. 3.

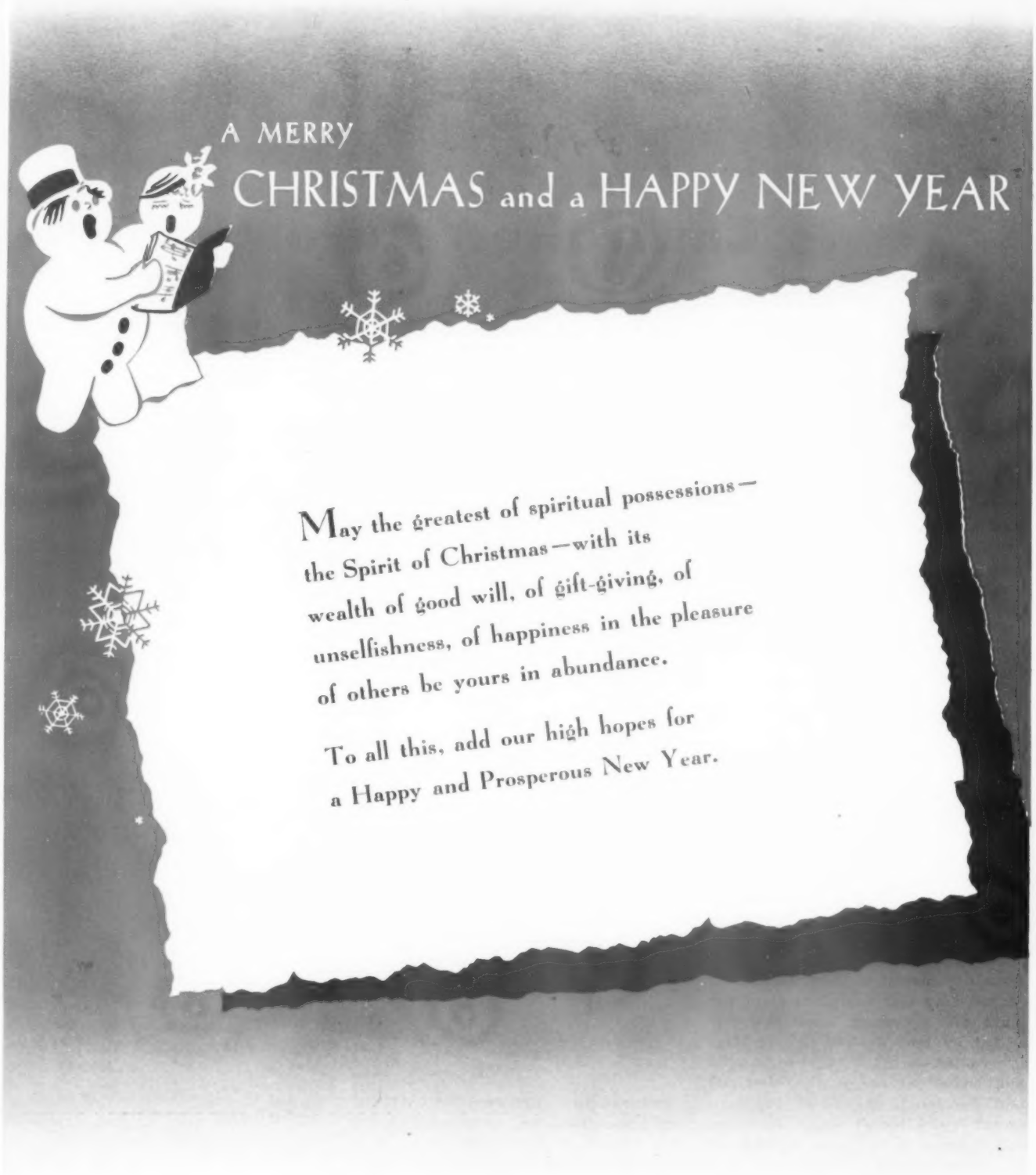
NONFERROUS SOCIETY SEEKS ALUMINUM

(*Concluded from page* 91)

secretary of the National Castings Council, gave a general report on the work of the NCC during the past year. He also reported on the organization of the Foundry Industry Advisory Committee to the Munitions Board of the Military Establishment and indicated that the appointment of subcommittees covering the various branches of the foundry industry was the next item on the committee agenda.

Lee C. Wilson, expert on foundry equipment and supplies, National Security Resources Board, Washington, gave an interesting report on "Foundry Responsibilities During This Peacetime Emergency." He discussed in some detail the survey of capacity which is being undertaken by the NSRB to determine requirements and productive facilities for foundry equipment and supplies in case of emergency. He indicated that the foundry equipment industry is in good shape to meet an emergency. Mr. Wilson also explained the functions of the NSRB and the general overall setup for handling the studies which now are being made.

At the annual banquet in the evening, Don Rose of the *Philadelphia Evening Bulletin* spoke on "Confessions of a Columnist."


A MERRY
CHRISTMAS and a HAPPY NEW YEAR
May the greatest of spiritual possessions—
the Spirit of Christmas—with its
wealth of good will, of gift-giving, of
unselfishness, of happiness in the pleasure
of others be yours in abundance.
To all this, add our high hopes for
a Happy and Prosperous New Year.

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Snyder Foundry Supply Company, Los Angeles, California; Snow & Galgiani, 533 Second St., San Francisco 7, Calif.; Carl F. Miller & Company, Seattle, Washington; M. W. Warren Coke Company, 1017 Olive St., St. Louis 1, Mo.; E. R. Frost Co., Inc., Minneapolis 14, Minn.

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Mold Hot-Top Is Controlled Automatically

By F. A. FURFARI
Consulting and Application Engineer
Westinghouse Electric Corp.
Toledo, O.

AN unusual and practical method for keeping the head metal in molds for steel rolling mill rolls in a molten state to compensate for shrinkage as the metal in the main part of the mold cools has been developed for the Ohio Steel Foundry Co., Lima, O.

The method involves use of a "hot-top," consisting of two carbon electrodes which maintain an arc on top of the casting between the metal and the electrodes. This keeps the head metal molten during the casting solidification period. Application of this apparatus also permits the use of a minimum amount of head metal to feed the casting during the cooling period, which requires from 4 to 7 hours depending on the size of the roll being cast. Weights of the rolls range from 7 to 50 tons before machining to size.

Power for the hot-top arc is supplied by four transformer type alternating current welders, each rated at 500 amp and energized from the plant 440 v system. Each electrode is fed by two welders having their low voltage terminal wired in parallel and connected across the electrode and the mold. Electrodes are supported by a holder which is raised and lowered by a small 3-phase alternating current motor.

When the hot-top first was placed in service on a mold, an operator manually controlled the electrode motor by a pushbutton-operated reversing starter to establish and maintain the arc; he continued such manual operation while observing the arc, making adjustments to the electrode position as necessary. This, obviously, required that a workman must devote his attention, continuously, to the mold during the entire cooling period, although the electrode position needs only an occasional adjustment to compensate for lowering of the metal level, shortening of the electrodes, or any other cause that would tend to change or extinguish the arc.

In order to release the workman for other more productive work, an automatic controller was developed by Westinghouse to do this job. It is a relatively inexpensive positioning regulator which employs a contact-making ammeter as the regulating element; this device is very similar to the induction type overload relay. It continuously measures the arc current and operates a reversing starter on the electrode motor to raise or lower the electrodes as may be required to counteract any changes in current and thus keep it regulated within reasonably close limits.

To place the hot-top in operation the operator now lowers the electrodes onto the mold through operation of a manual control switch until the arc is well established. The control switch is then placed in the automatic position, and the value of the arc current, as indicated by an ammeter on the operator's panel, is adjusted by a small rheostat.

When the current is reduced below the normal range, the contact-making ammeter closes its "lower" contacts and momentarily energizes the "lower" control relay. This in

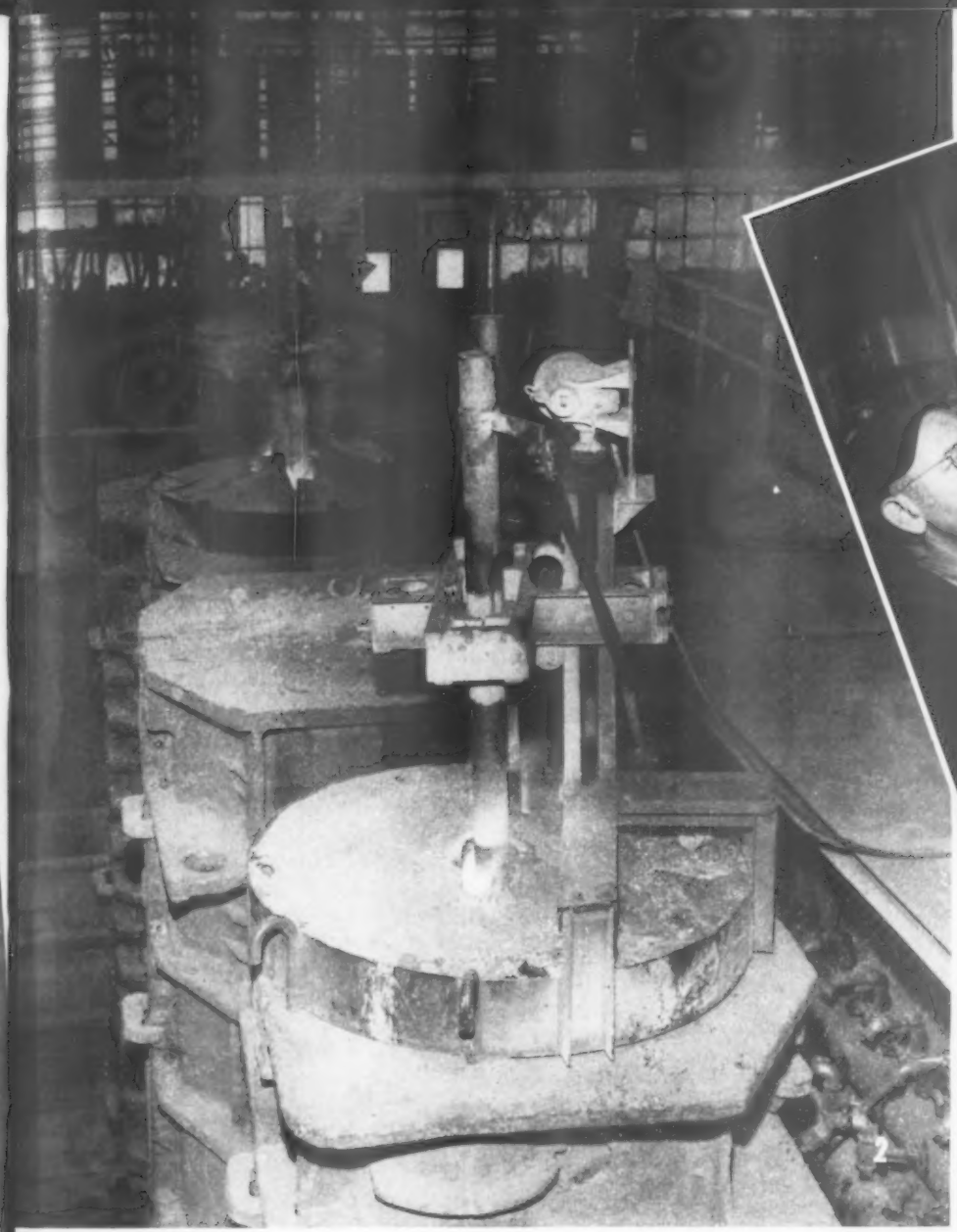


Fig. 1 — Control cabinet housing contact-making ammeter (upper right) timing relay, reversing starter for electrode motor and allied equipment

Fig. 2—Two hot-top units in operation at Ohio Steel Foundry Co.

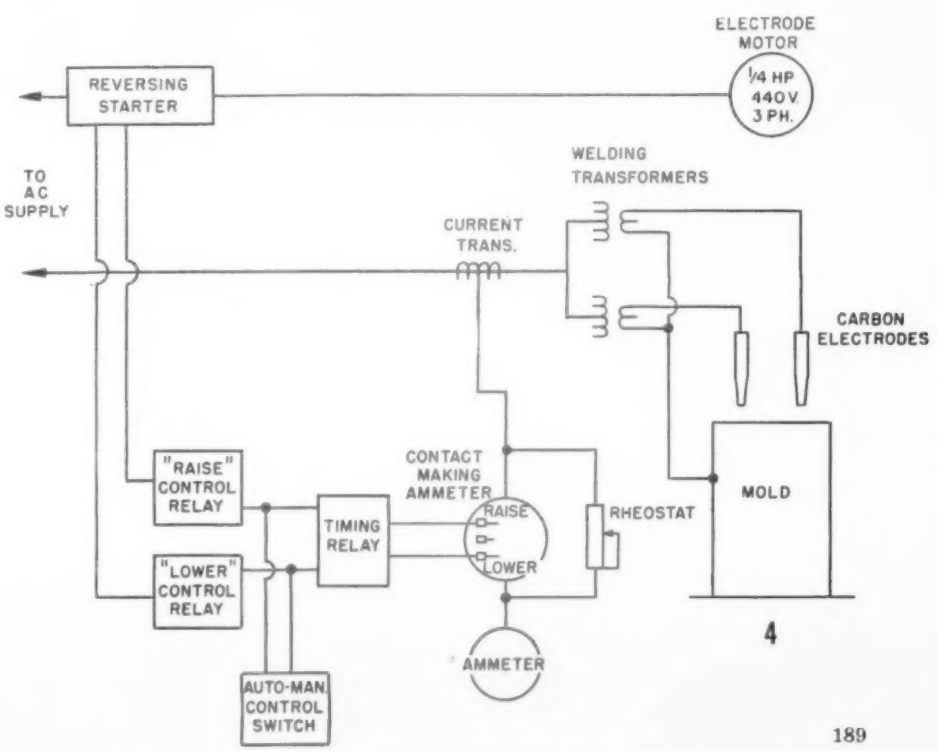
Fig. 3 — Operator manipulating automatic-manual switch on the control panel

Fig. 4—Schematic drawing of the hot-top controller

turn operates the reversing starter to momentarily run the electrode motor in the proper direction to lower the electrodes a slight amount. The momentary operation is determined by a mill-type timing relay.

If this slight lowering of the electrodes is not sufficient to increase the current sufficiently, the "lower" control goes into operation again, after a short time delay provided by the timing relay, to operate the electrode motor in the proper direction to lower the electrodes another slight amount. This procedure continues until the arc current increases to the normal value.

If the current should increase above the preset value, the contact-making ammeter closes its "raise" contact and the "raise" control relay is picked up and dropped out automatically, in the same manner as described previously, until the electrode is raised sufficiently to restore the arc current to normal.



Why You Find

SPENCER TURBO COMPRESSORS

in Foundries Everywhere

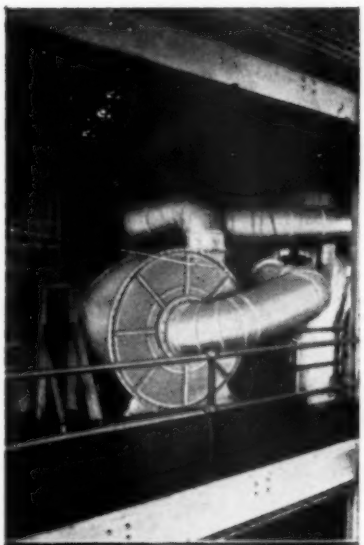
The principal reason why you find so many Spencer Turbos on cupolas is the reliability experienced over years of service.

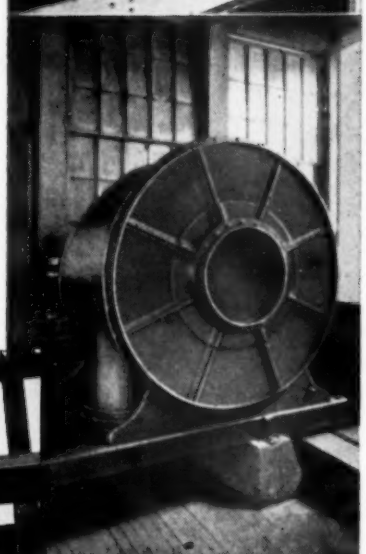
Simplicity is the answer. One rotating element with wide clearances and only two bearings. Cast iron bridge construction and light weight balanced impellers mean minimum vibration, no special foundations and negligible wear even after years of service.

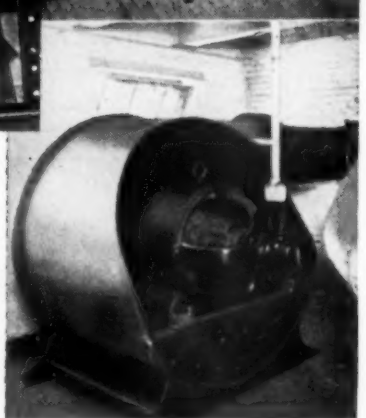
Hand or automatic blast gate control—any capacity required. Ask for bulletin No. 112.

AND SPENCER FOR CLEANING

The dust count is reduced, molds and patterns cleaned in modern foundries with Spencer Portable and Stationary Vacuum Cleaning Systems. Ask for the bulletins.







ASK FOR BULLETINS

Foundries	No. 112
Data Book	No. 107
Gas Boosters	No. 109
Four Bearing	No. 110
Blast Gates	No. 122
Technical Bulletin	No. 126

332-B

SPENCER HARTFORD

THE SPENCER TURBINE CO.

HARTFORD 6, CONN.

MECHANIZES MALLEABLE IRON FOUNDRY

(*Continued from page* 76)

Castings are shaken out almost immediately and automatically and sent through an intermittent type tumbling barrel from which they are discharged in a steady stream and carried by belt to the sorting and inspection department. Castings are annealed in a battery of six ovens fired with powdered coal and operated on a 6-day production schedule.

Method of loading and packing the annealing pots before annealing and the subsequent shaking out are worthy of special comment. An exhaust system collects smoke and dust from every area where generated and provides a clean atmosphere in the building. In addition to eliminating most of the burdensome features of the work connected with the production of castings, the company installed extensive shower and locker facilities for the employees. As a matter of record, for many years the company has exercised a paternal attitude toward its employees inside and outside the plant. This is an important feature in promoting shop morale and esprit de corps, especially in a small town where employees and dependents represent a considerable part of the population.

Increase Casting Production

One of the most gratifying features in connection with the new equipment is the manner in which production of castings increased, in some instances over 100 per cent. Record day's runs of 400 molds are not uncommon with specially skilled men. This is at the rate of about one mold per minute.

Since the two conveyor lines are identical in every respect, construction and operating features, a description of one will serve for both. The conveyor differs in many respects from the conventional type foundry where the entire load is actuated by a single motive power unit. In the present instance four trains of 24 plates or mold trays are pulled by small electric locomotives operated on the third rail principle. This arrangement permits the trains to halt temporarily at the molding station, the pouring station, the cooling tunnel and the shakeout. At the shakeout station an automatic switch diverts the locomotive and train to a section of the conveyor where the load is moved slowly by reduction gear, chain and sprocket while an

(*Continued on page* 192)

PUBLIC UTILITIES

FEDERAL BUREAUS

STATE AGENCIES

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METAL

Non-Ferrous and Ferrous Foundries: Steel Mills and Smelters: Brass Rolling Mills: Heat Treaters and Annealers.

CERAMIC

Potteries: Art Potteries: Manufacturers of Grinding Wheels: Sanitary Ware: Floor and Wall Tile: Electrical Porcelain; Miscellaneous Ceramic and Enamel Plants.

AUTOMOTIVE

Foundry, foundry cleaning, abrasive cutting-off, heat treating, tool room and precision grinding and finishing departments.

CHEMICAL

For applications where high temperatures or other severe operating conditions indicate the use of special refractories and cements.

SHIPBUILDING

Weld grinding, abrasive cutting-off, tool room and precision grinding, foundry, foundry cleaning, heat treating, power plant refractories.

DIAL YOUR INDUSTRY FOR RELIABLE NEW SOURCE OF SUPPLY AND COOPERATION

The satisfying economy and efficiency of Electro specialties for exacting industries prove the value of Electro Engineering and Chemical Research. To the results of this cooperative research, we add the experience and training of our field engineers at job-side. These men are recruited from technical institutions; trained in Electro's laboratories and departments; and assigned to cooperative work in various industries before promotion to their rank of Field Engineer. We shall welcome your request for an exploratory survey of a single operation or of a series of operations to determine whether Electro's specialized products and cooperation would be advantageous to you. Why not phone, write or wire today?

ABRASIVE WHEELS

Resin-bonded, High-Speed Grinding Wheels to cover nearly every conceivable use from snagging and cutting operations to fine precision grinding.

CRUCIBLES

Crucibles, (Tercod-Conqueror) Pedestal Blocks and Pot Lids—The Carbon-bonded Crucible for melting aluminum—nickel—copper—the brasses and bronzes—zinc—silver—gold—iron, using any fuel: oil, gas, coke or coal, electricity.

REFRACTORIES

Special Refractories—Electric furnace refractories of all kinds used for:

CERAMIC KILN FURNITURE—Slabs and Posts for rigid, floating or semi-floating open construction; plate setters, tile setters, sanitary ware setters and silicon carbide saggers.

MUFFLES AND HEARTHS—One piece and sectional for enameling furnaces, tunnel kilns, assay and heat treating furnaces, pottery kilns.

CRUCIBLE FURNITURE—Linings, covers.

PYROMETER TUBES—And tubes for other purposes.

BRICK—9" series or special shapes to individual specifications.

BURNER BLOCKS—And for electric furnace door blocks, door frames, port blocks and electrode sleeves.

STOPPER HEADS—For steel ladles; also slag hole and tap hole blocks for Cupolas.

CEMENTS

Cements and Ramming Compositions—Of special refractories used by all industries; monolithic linings for electric, gas and oil furnaces; patching furnace walls, laying brick, boiler setting and ladle linings.

ALLOYS

Special compositions for additions, deoxidation, degasification, purification: Copper—Aluminum—Chromium—Titanium—Nickel—Silicon—Magnesium—Iron—Lithium—Calcium—Calcium Boride—Tin—Zinc—Lead.

K-357

Electro Refractories & Alloys Corporation

344 DELAWARE AVE. — West Coast Warehouse LOS ANGELES — BUFFALO 2, N. Y.

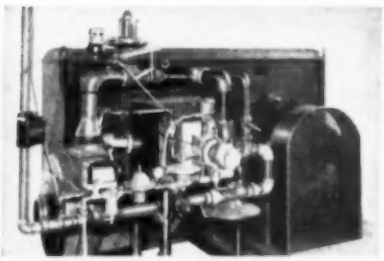
THE *Scroll-Aire* OVEN HEATER

FOR

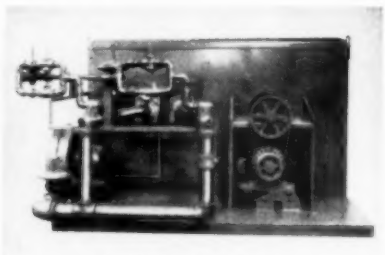
PAINT DRYING, PROCESSING and CORE OVENS

PROVEN

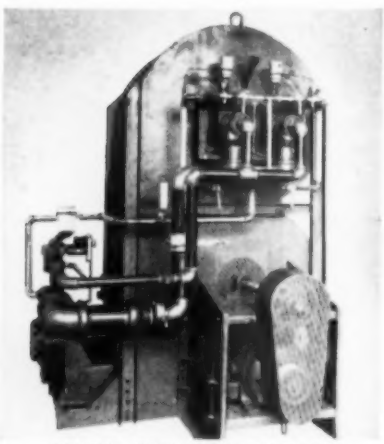
~~TESTED~~ **ON A VARIETY OF APPLICATIONS LIKE THESE . . .**



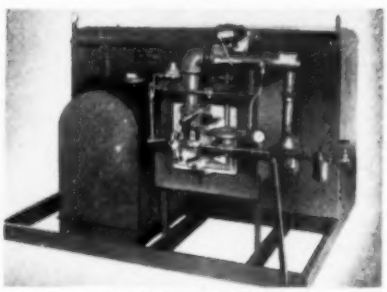
WESTINGHOUSE ELECTRIC MFG. CO.
Burns Gas and Oil



FORD MOTOR CO.
Burns Two Types of Gas



DETROIT GREY IRON FOUNDRY
Burns Gas Only



THE PARSONS CO.
Burns Oil Only

These four installations show how the Scroll-Aire Oven Heater can be adapted to various types of fuel and other conditions. Note the installation at Detroit Grey Iron Foundry (for Core Ovens) was made vertically to suit cramped conditions.

For greatest fuel economy, highest combustion efficiency and maximum versatility, the Scroll-Aire is proving itself on new applications daily. Write now for catalog which gives complete details on operation.

EST. 1912

NEWCOMB-DETROIT

Engineered Systems—Standard Units

Spray Booths • Ovens • Metal Parts Washers • Fans
Dust Collectors • Heaters • Air Handling Equipment

Grand Rapids Div.—Plant	*Main Office and Plant*	*Western Sales*
GRAND RAPIDS 2, MICH.	DETROIT 11, MICH.	CHICAGO 5, ILL.

(*Continued from page* 190)

automatic device, including a small pneumatic cylinder, dumps each mold. The lower edge of each bottom board rests against small projecting members on the mold trays and remains on the conveyor. The body of sand enclosing the castings falls through a chute onto an apron conveyor which carries it to a shakeout. From the shakeout the castings are carried by another apron conveyor and discharged into a continuous tumbling barrel. By suitable belt arrangement, sand from the two dumping stations is discharged into one storage hopper. Castings from the two units pass through the tumbling barrel and through all other operations as a single product.

Trains Move Automatically

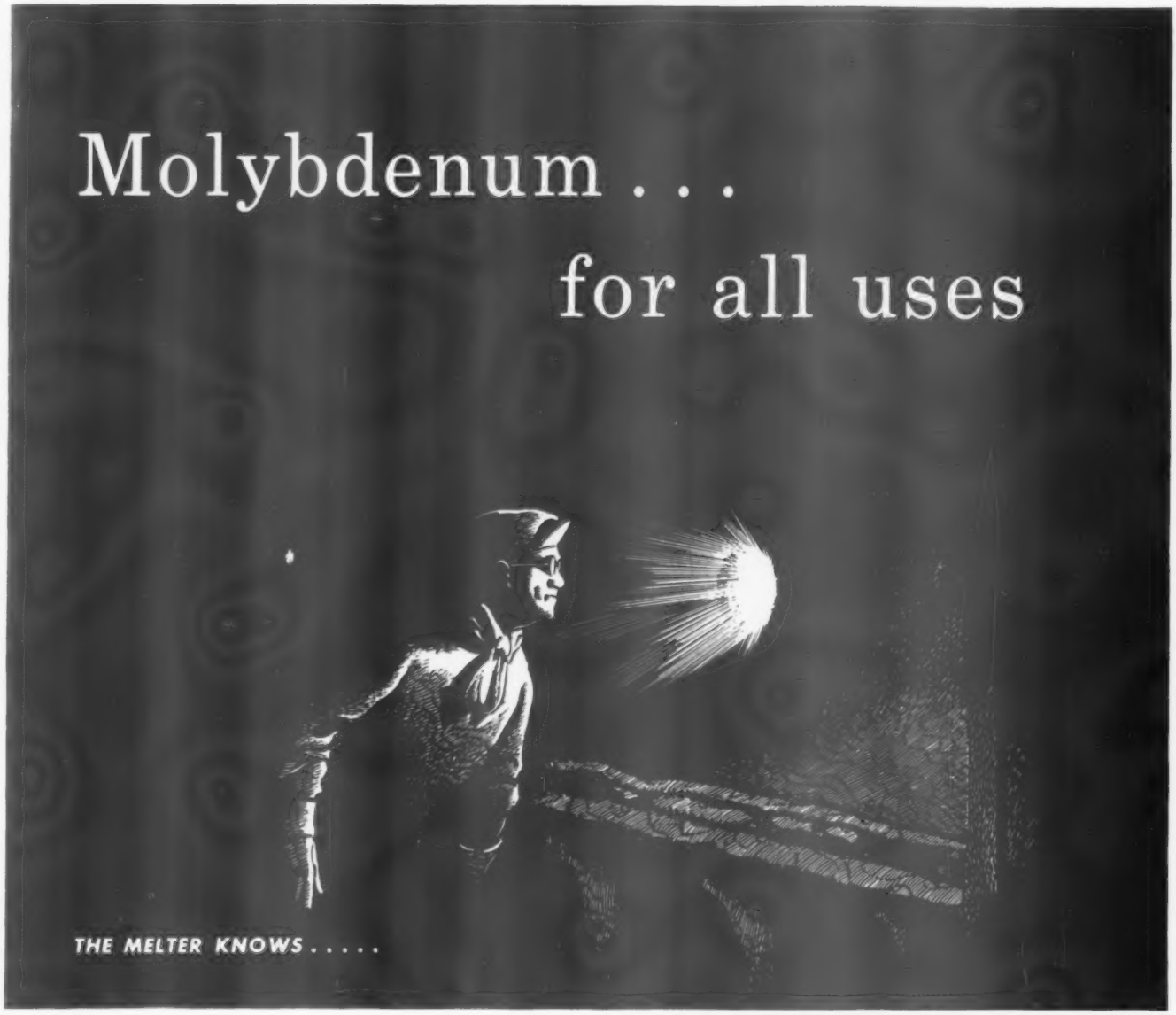
By the time the last molds on the train are dumped, the locomotive at the head of the train has advanced on the second leg of the conveyor to a point approximately opposite the shakeout and the last car is clear of the chain drive. The locomotive then automatically makes contact with the third rail and moves at greatly accelerated speed to the area served by the molding machines, where it halts for 5 minutes while the molders are placing the molds on the buggies. Automatically at a given signal the train moves forward to the pouring loop where it again halts for 5 minutes. When the molds are filled with metal, the train again travels rapidly around the turn and into the cooling tunnel where it remains stationary for 5 minutes. Then it moves forward again on the last lap of the journey to the point where the switch diverts the train to the short chain driven section where the molds are shaken out.

The entire cycle is controlled automatically and, if necessary, the speed may be set in advance to meet variation in the mold production unit. While the movement of only one train is described, the conveyor has accommodation for four trains which follow each other in orderly and regular sequence. Total length of the elliptical conveyor is 200 ft. Each train makes 88 round trips per day, with a resulting production for the entire system of 11,000 molds. Miscellaneous castings made on the side floor are not included in this total.

Sand from the shakeout is passed over a magnetic separator and then conveyed by a long inclined belt to a storage hopper under the roof level. Here it passes through a revolving screen which removes unbreakable sand lumps and core butts.

(*Continued on page* 194)

Molybdenum . . .
for all uses



THE experienced melter knows he can depend on Molybdenum additions for uniform effects as calculated. He knows the customer can depend on the higher physical properties that Molybdenum adds. His comfortable assurance in the use of so trustworthy an agent is good to have. As a supplier of Molybdenum, Tungsten, and Boron, the Molybdenum Corporation is glad to be consulted at any time.

AMERICAN Production, American Distribution, American Control, Completely Integrated.

Offices: Pittsburgh, New York, Chicago, Cleveland, Detroit, Los Angeles, San Francisco, Seattle.

Sales Representatives: Edgar L. Fink, Detroit; Brumley-Donaldson Co., Los Angeles, San Francisco, Seattle.

Subsidiaries: Cleveland-Tungsten, Inc., Cleveland, O.; General Tungsten Manufacturing Co., Inc., Union City, N. J.

Works: Washington, Pa.; York, Pa.

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MOLYBDENUM CORPORATION OF AMERICA
GRANT BUILDING PITTSBURGH, PA.

MCA

MANHATTAN V.D.B. WHEELS EASE the work and SPEED the job

No "chatter" . . . No "jumping" . . . Longer wheel and tool life . . . when your hand grinders are equipped with Manhattan Abrasive Wheels with the patented Vibration Dampener Bushing (Pat. No. 2,187,350).

The lower fatigue factor permits workers to "stick at it" longer. A user reported recently "10 hours production in only 8 hours working time."

For better and faster grinding at lower cost, look to Manhattan Abrasive Wheels. At your request, a Manhattan field engineer will call to study your needs for snagging, cut-off, centerless grinding, or finishing wheels. His suggestions make dollars and sense . . .

RAYBESTOS-MANHATTAN INC.

Keep Ahead with Manhattan

MANHATTAN RUBBER DIVISION PASSAIC, NEW JERSEY

(*Continued from page* 192)

This material falls through a chute to a container placed there for the purpose. Later this container is picked up by a lift truck and the contents dumped at a point back of the cupolas. From the storage hopper the sand is fed in batches to a muller type mixer where definite amounts of water, new sand, bentonite and seacoal are added to maintain certain standards—moisture 4 per cent, permeability 60 to 70, green compression 6.5 to 7.5 lb.

Since the main product is chain links ranging in size from ¾ to 12 in., and in weight from less than an ounce to 8 lb, it is apparent that the sand is not exposed to severe service. It is at normal temperature by the time it leaves the muller and conveyed by belt to above the two rows of hoppers in the center of the foundry. The stream of prepared sand keeps all the hoppers filled above the molding machines. Surplus sand in the vicinity of the molding machines does not accumulate on the floor. It falls through a grating in the floor onto a belt which carries it to the main apron conveyor leading from the shakeout stations to the magnetic separator and eventually to the storage bin.

Control the Sand

Through bond, permeability, moisture content and grain size tests carried out in a well-equipped laboratory, the quality of the sand is closely controlled. An excellent paper on a similar phase of operation was presented at the 1942 Cleveland convention of the American Foundrymen's Society by D. F. Sawtelle, Malleable Iron Fittings Co., Branford, Conn.

Hot castings from the shakeout are carried on an inclined, two-speed, slat conveyor and discharged into a long revolving barrel, set at a slight incline and provided on the inside with spiral baffle plates. Castings, gates, sprues and scrap are discharged onto a long conveyor where operators remove larger castings which do not enter the cleaning barrel and throw them into containers set there for the purpose. The smaller castings are fed into the cleaning barrel and are emptied after cleaning onto a belt.

Castings freed from the gates and sprues travel on this belt into an adjoining room. A number of women operators stand alongside this belt and pick off the castings, which are thrown into small hand tote boxes according to classification. The loaded boxes are pushed along short roller conveyors to the hard iron

(*Continued on page* 196)

FOR ENDURANCE AND LONG LIFE BUY SPO MOLDING MACHINES

Thanks to SPO's Inverted Jolt Feature..

You Can't Beat the No. 200 Series for making Cope and Drag Molds

SPO No. 2222
Jolt-squeeze-strip Machine

SPO's inverted jolt feature is a definite step forward in the design and performance of modern molding machines. In hard, continuous, thumping use — day in and day out — this exclusive development consistently turns out more good, accurate molds at a uniformly lower cost. You profit, too, from a new low in maintenance, with a correspondingly new high in service and endurance. Write for all the facts about the SPO No. 200 Series, rapid-fire producers of both cope and drag molds for higher earnings in 1949.

MEMBER

Always find out first what SPO has to offer.

SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE • • CLEVELAND 5, OHIO

(*Continued from page* 194)

grinders, and from there into the annealing department. Here they are placed in annealing pots stacked four high, run under a pair of flexible tubes and packed with gravel. The pots are sealed with mud, picked up by a lift truck and placed in the first available oven in a battery of six.

After the castings are annealed they are removed one stack at a time to a special shakeout device. The lift truck places each stack in turn in a small exhaust-connected chamber. Clamps engage the stack and hold it in position while the truck backs away temporarily. Contents of the stack fall on a vibrating screen. The packing material falls through and is lifted by an elevator and returned to the reservoir for further use. At regular intervals the fines are winnowed out. The castings go over the end of the vibrating screen and drop into buckets suspended from a monorail. The castings are taken to two airless blast units, then to final finish and inspection in preparation for shipment.

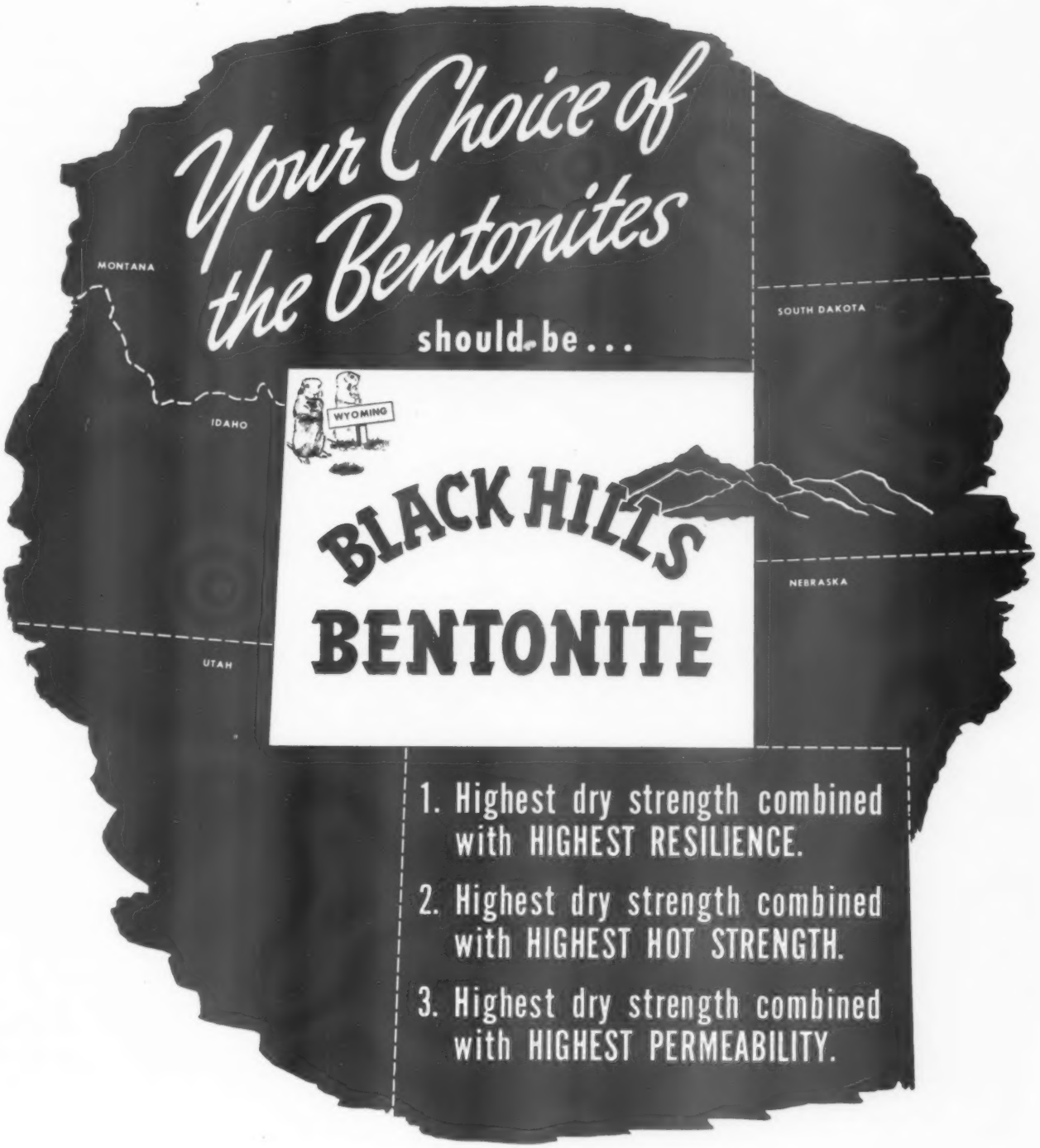
Ample Melting Equipment

Melting equipment at the east end of the foundry includes two cupolas lined to 34 in., a 12-ton air furnace and a powdered coal unit. Each cupola is in blast on alternate days and delivers metal directly to the air furnace where the metal is refined and maintained at a temperature of 2880° F. Iron is tapped intermittently from the air furnace and flows alternately through a double branch spout into 250-lb ladles suspended from two monorails, one leading to the pouring station on the left conveyor, and the other leading to the conveyor on the right. A specially trained pouring gang handles the ladles and pours the metal with all the nicety of speed and skill formerly exercised by the molders

The one-man pouring ladles are attached to individual hoists. With no shank projecting on one side the ladles can follow each other closely under the furnace spout. Four ladles are filled at each tap with enough metal to fill two train loads of molds.

Each individual charge for the cupola, including 1000 lb pig iron and scrap, 125 lb coke and 30 lb limestone, is loaded in a dump box mounted on a monorail equipped with a large, easily read scale. Return sprues, gates and scrap retrieved from the high conveyor belt are dumped on the floor and shoveled into the charging box as required. Other materials are handled in the same manner, a relic of former practice.

(*Concluded on page* 198)



manufactured and sold by

EASTERN CLAY PRODUCTS, INC. • JACKSON, OHIO

ECP offers foundrymen a total of five distinct types of bond clay which, used singly or in combination, fit every foundry requirement for synthetic sand.

ONE OF 5 ECP PRODUCTS SOLD WITH SERVICE THAT MEANS SOMETHING!

CUT CLEANING-ROOM COSTS!
STEP-UP PRODUCTION!
with the Milwaukee-
Tessmer Sprue Cutter . . .

MODEL H — with Built-in Motor Drive and Speed Reducer.

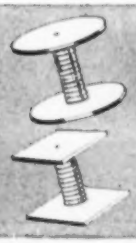
Cutting sprues and gates on non-ferrous castings becomes a one-man operation with this machine. What's more, a skilled operator isn't needed. Any workman can learn to run the Milwaukee at top capacity in a short time.

It results in a fast, steady flow of work through the cleaning department; accumulations of unfinished work are eliminated, less storage space is required because castings are trimmed and cleaned as they come from the foundry.

With the Milwaukee, ONE SWIFT, SURE STROKE clips gates or sprues in a matter of seconds; slow, tedious hand labor is eliminated, manpower released for more important work.

All models of the Milwaukee-Tessmer Sprue Cutter are fully described in a New Illustrated Bulletin. Write for your copy.

RICE PUMP & MACHINE COMPANY
Division of Milwaukee Chaplet & Mfg. Co.
1025 SOUTH 40th ST. MILWAUKEE 4, WISCONSIN



MILWAUKEE CHAPLET

(Concluded from page 196)

Under the rejuvenation plan still in progress, coke and iron, also sand, will be unloaded from railroad cars into a row of concrete bins on the north side of the foundry. With a sharp slant to the bin floor, the iron and coke easily may be moved down and into the scale equipped charging bucket. Until the bins are ready the material is brought in from the yard, dumped on the floor and then loaded by hand into the dump bucket. From the bucket the charge is dumped into a skip hoist which carries it to a point about 40 ft above the floor. Here the skip is tripped and the contents fall into the cupola.

The two cupolas, mounted on extra long legs to facilitate delivery of metal direct to the air furnace at a point near the center, are served by a blower in which the volume of air automatically is controlled to harmonize with the composition and temperature of the metal bath.

Manufacture Chain Links

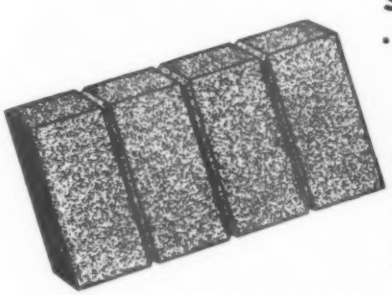
Principal product of the foundry is industrial chain links in almost infinite variety. Each link requires a small cylindrical core to form the hook at one end of the link. Cores are made in a space walled off at the west end of the foundry and dried in two ovens, also relics of a former regime and to be replaced by others of the most modern design in the immediate future. They served satisfactorily for many years, but they cannot quite keep up with the pace set by the new molding department. A considerable quantity of cores is supplied by outside interests.

To any person interested in the subject and familiar with the development of foundry ovens to the present degree of perfection, the present ovens, soon to be replaced, indicate the march of progress. No doubt at the time of their installation they were regarded as the last word. Each oven is a plain brick chamber with an upright shaft in the center. Top and bottom ends of the shaft rest in suitable bearings. Half a dozen circular shelves attached to the central shaft hold the loaded core plates. The plates are inserted through doors at the side nearest the coremaker's stations, pushed around gradually to a point above a flaming oil burner, and removed through doors on the side opposite the point of entrance. The hot plates are handled by a short steel bar with a horizontal slot at one end. To a casual visitor the entire operation is reminiscent of the outdoor bread baking ovens still in use among the *habitants* of rural French Quebec.

"Whale" of a difference clean metal makes in castings!

Famous Cornell Cupola Flux has proved its ability as a metal cleanser so effectively that leading foundries have placed it among the "musts" in casting production, for clean metal means *more uniform, denser grained castings,* and *easier machining.* Furthermore, its reduction of sulphur is very noticeable.

Another feature of Famous Cornell Cupola Flux that is greatly appreciated: Cupolas are kept cleaner, drops are cleaner and labor for maintenance is practically nil.



SCORED BRICK FORM
. . . the easiest to use.
. . . saves labor.

No weighing. No measuring. You simply toss Famous Cornell Flux into cupola for each ton charge of iron or break off one to three briquettes (quarter sections) for smaller charges.

Write for Bulletin 46-B

The CLEVELAND FLUX *Company*

1026-1036 MAIN AVENUE, N. W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918.

Pour Clean Metal and get Better Castings..

Use

Famous CORNELL CUPOLA FLUX

FAMOUS CORNELL FLUXES
Trade Mark Registered

Write for Bulletins ➡

Famous CORNELL ALUMINUM FLUX

Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

THE ADVENTURES OF Bill

By PAT DWYER

Drawings by RICHEY

HERE we are again," I remarked the other night with full realization that the remark lacked any redeeming touch of originality. "Here we are again creeping in on the frozen tail of the year 1948. It is just an even bet whether or not we shall make it this time. Seems to me the job is getting a bit more difficult each year."

One of these Job's comforters, who argues over the plainest of statements, and prudently retires before one has a chance to push him around a little, maintained that this is not the tail of the year. Before I could elaborate further on this theme, kind of doll it up a little, he continued to claim that this is going to be a long and bitter winter.

"When you ignore the calendar," he said, "and depend on common sense backed by long years of experience, you will realize this is just the beginning of the season of the big snows, the heavy ice on lake and river and the wind that penetrates any kind of clothing. I often wonder how the old time brawny lads survived the winter. Pretty hardy boys to go prancing around in a metal coat and pants and with the head encased in a cast iron Kelly. And then think of the young, sporty guys with chain mail undershirts. Probably nice and cool in summer, but off-hand I should say a bit nippy in the winter."

Bill's principal argument on the weather problem was based on the fact that for a period during the month of August, the mercury in the thermometer, every thermometer, constantly hovered around the 100 mark. (Note to proofreader. Perhaps you had better make that 100°F) Some readers are so short-tempered that if an error of that kind crept into any discussion or reference on the subject of metal temperatures, they immediately would write a long letter of protest and end with the postscript "Sir, you can cancel my subscription." The patent fact that the figures may have represented a printer's or a proofreader's, rather than an author's error, is not allowed to rear its ugly head.

"I wish," Bill said, "you would stick to one subject. I intended to show you with suitable quotations and footnotes, that an exceptionally hot summer always is followed by a cold and bitter winter. On the other hand, a cold and dismal summer usually is followed by a mild winter. How am I—hereafter known as the party of the first part—how am I going to bury the party of the second part in a mass of statistics if the aforesaid party of the second part persists in introducing absolute drivel about letters to the editor?"

"Did you say mass or mess?"

Bill assumed the patient expression of a molder waiting for the craneman to give him a lift.

"Perhaps," he said, "I had better begin at the beginning."

"I have heard considerable favorable comment on the idea," I admitted cautiously. "In fact, I understand that many prominent men consistently use the method. They begin at the beginning, plow through the middle and make a more or less graceful landing at the end. Let's see you take off."

"This here now theory or legend or tradition about the hot and cold summer and winter was in existence long before my time. With the exception of a few cynical individuals who thought things out for themselves, and therefore were regarded as suspicious characters, every person was prepared to discuss the subject any time. Some of the more advanced thinkers claimed that the Gulf Stream was responsible, while others more or less vaguely hinted at the influence of sun spots. Up to the present I have not heard or read any reference to the atomic bomb, but I shall not be surprised one of these days to read a highly scientific account proving conclusively that the weather is influenced by secret atomic energy released by ancient scientists in Babylon, Egypt or Rome. These lads were at war with some enemy all the time. When they were not fighting an outside enemy, they were fighting among themselves. Loss of men and materials was not equal to that in World Wars I and II, but that merely goes to show how mankind has improved over the centuries.

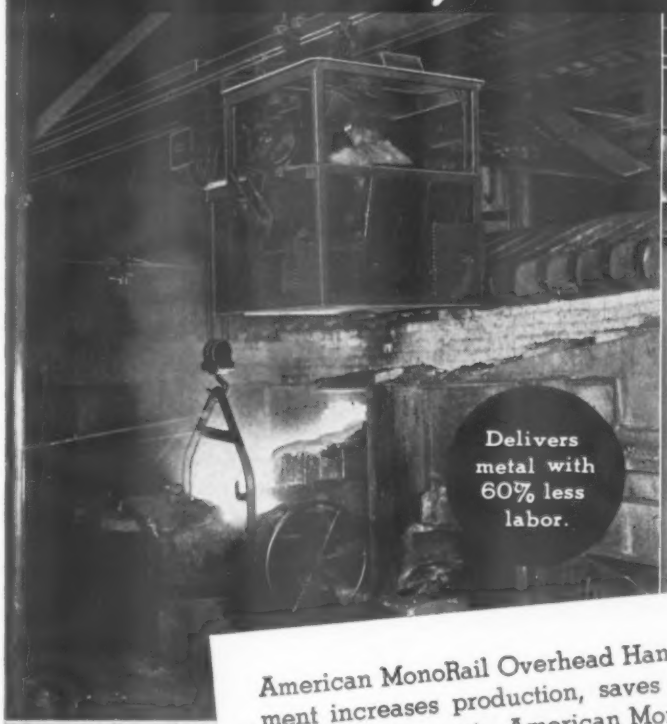
"You were mumbling and grumbling a while ago about winter creep-

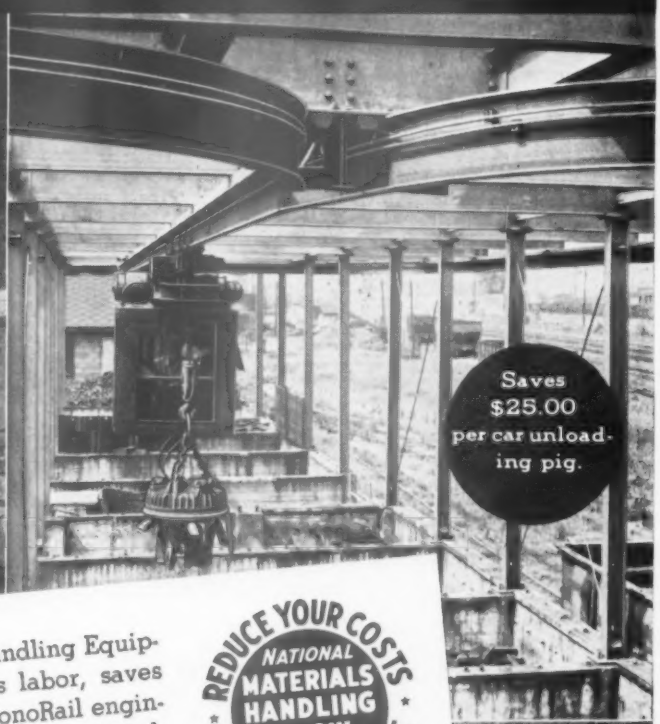
(*Continued on page* 202)

In days of old, as we are told, the knights were bold and also, alack, were sometimes cold

AMERICAN MONORAIL EQUIPMENT

Pays and Saves





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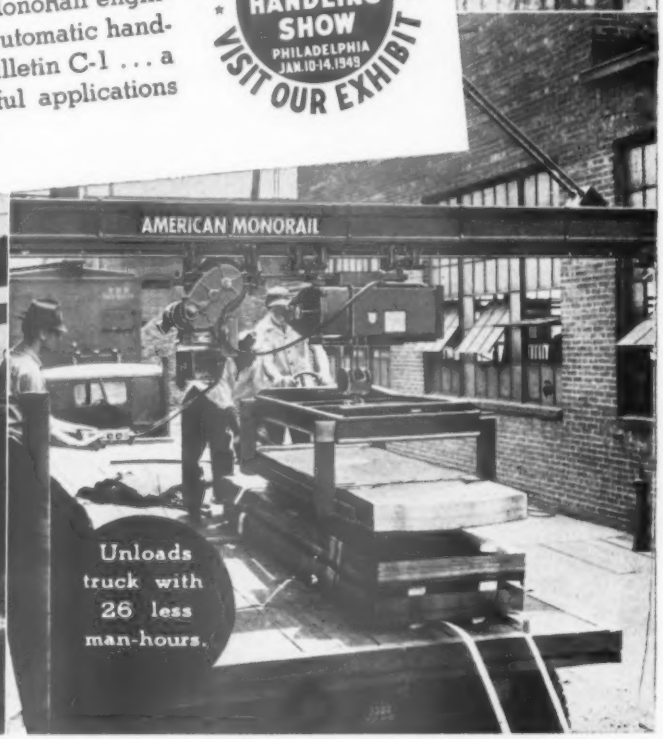
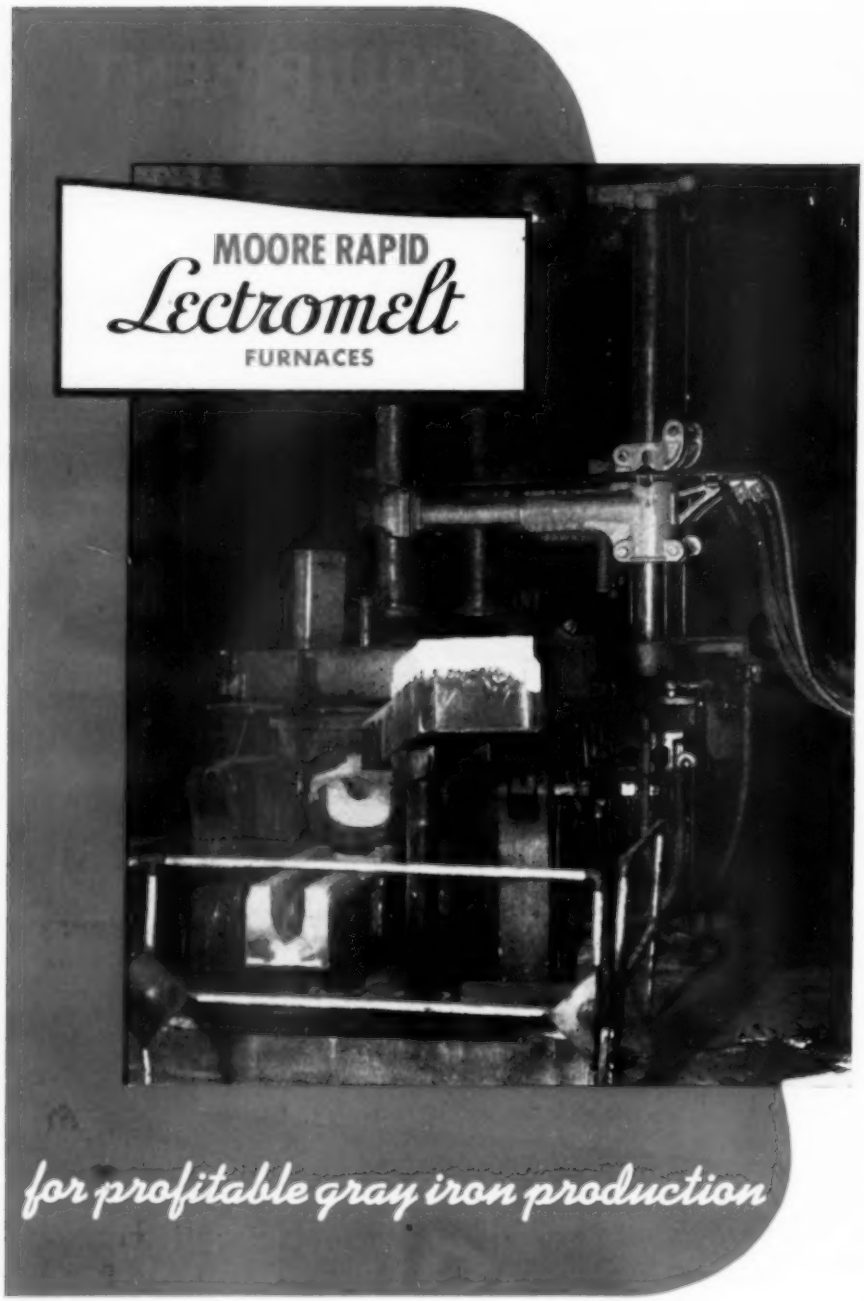


THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE — CLEVELAND 7, OHIO



The precise analytical and temperature control of Lectromelt furnaces produce gray irons which are strong, dense, clean and readily machineable. The Lectromelt forehearth furnace—designed for use in conjunction with other melting equipment—provides the means for overcoming some of the present difficulties due to poor raw materials.

Lectromelt furnaces are made in capacities ranging from 100 tons to twenty-five pounds. Write today for complete details.

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		BELGIUM	S. A. Belge Stein et Roubaix, Bressoux-Liege
ENGLAND, SWEDEN, AUSTRALIA	Birlec, Ltd., Birmingham, England	SPAIN	General Electrica Espanola, Bilbao
		ITALY	Forni Stein, Genoa

PITTSBURGH LECTROMELT FURNACE CORP.

PITTSBURGH 30, PENNSYLVANIA

(*Continued from page* 200)

ing up on us. You should take a bit of a gander through *The Old Farmer's Almanack.* That's the one with a picture of a human being with the front wall split open and folded back on each side. Arrow-tipped lines point to each of the main items to help the one-finger reader in this section of the field of general knowledge. Farther along in the text the reader is shown how these compressors, pumps, conveyor lines, information desk and signal station all work steadily day and night for years and years and years.

Without the help of a pinch bar or any other piece of outside equipment the heart keeps the blood in circulation from the instant you squall your way into the world, until the day you are laid out 'Clane an' respectable, glorybitagod' and ready for the soft-stepping lads in the long tail coats who take you out. They never bring you back. Frequently the publication modestly hints that the day may be postponed almost indefinitely if one keeps a supply of Old Doc Bunion's No. 41 on hand at all times. A liberal shot of this famous googum either before or after meals is guaranteed to keep the old engine running as slick and smooth as a $40 watch. Maybe I should have suggested this sovereign remedy to a foundryman who wrote me that he was having trouble with one of his pump castings.

Recently a customer complained that one of the cast iron shells on an 8-in. centrifugal sand pump housing had pulled apart on the bearing side. Metal thickness of this drag section is 1⅛ in. Eleven chills ⅞-in. thick and about 10 in. long are rammed up in each half of the main core. No chills in the flat area of the drag side. The chills are designed to increase the resistance of the metal to the scouring action of the sand when in service. The metal that pulled out is in one piece about 30 in. in diameter and almost a perfect circle. The fracture is about 1½ in. inside the area where the side of the chills end.

Other fractures show along the curved inside diameter of the shell and are spaced 10 in. apart, or just about the length of the chills. We are certain that the chills are instrumental in causing the cracks, but do not understand why the solid 1½-in. thick section of the bearing side should pull apart where it did. Would a series of flat segment chills rammed up in the core on the bearing side give the iron a more uniform cooling rate? Would some radial ribs on the outside of the shell help to reinforce the casting? How about normalizing or stress relieving? We have made dozens of the 6-in. size by the same method and never had any complaint.

Without actually seeing the entire performance, I said, from the closing

(*Continued on page* 205)

Announcing—

. . . . A NEW TECHNICAL SERVICE TO FOUNDRY SAND USERS

We are in business to sell tonnages of sand and we realize that our success depends on the results you obtain. We place our sand specialists at your disposal to help you correct difficulties which may have arisen through the use of sands not suited to your particular requirements. We specialize in semi-synthetic and synthetic sands for core room and molding practice and are able to supply you with the proper sand for your needs.

AMERICAN SILICA SANDS

The American Silica Sand Company has served the foundry industry exclusively for thirty years and production at our Ottawa district pits enables us to give you prompt delivery *at any time.*

We invite your attention to the accompanying coupon. There is no obligation on your part. Give us the opportunity to cooperate with you on your sand problems.

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Producers of Dried and Crude Silica Sands

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We Invite Your Inquiry

The American Silica Sand Company
Attention: Fred G. Kramer, Technical Adviser
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Okay, please DO have one of your sand technicians call on us in the near future. We are especially interested in
( ) Core Room Sands ( ) Molding Sands

Name . . . . . *Title* . . . . . .

Company . . . . . *Address* . . . . . .

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CORE AND MOLD OVENS

ALL TYPES . . . ALL SIZES

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SERVING INDUSTRY
OVER A
QUARTER CENTURY

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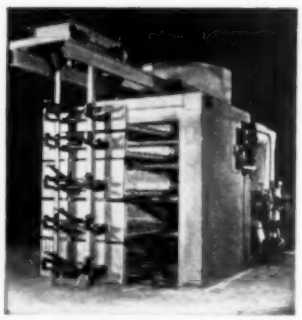
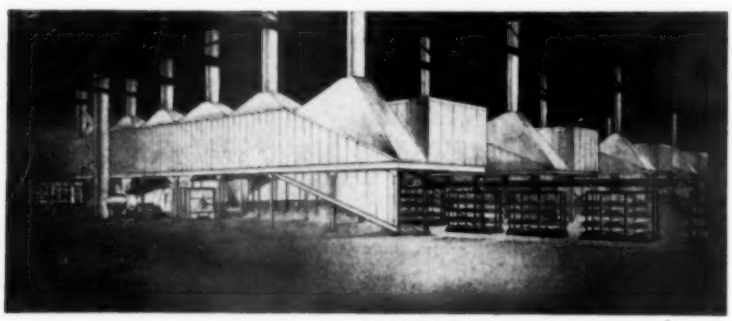
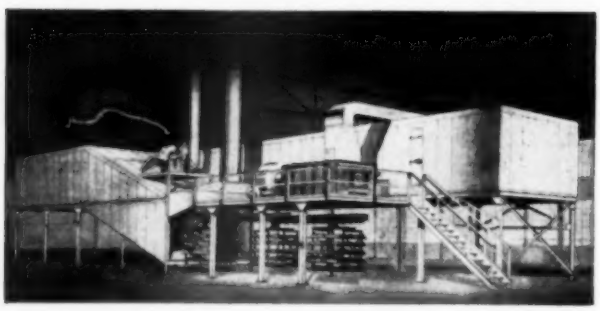


Rolling Drawer Oven Recirculating type. Fired with any fuel.

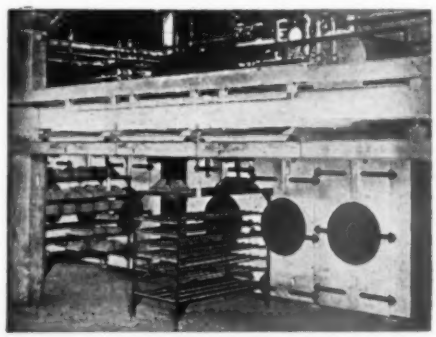


Four of the largest Continuous Monorail Core Ovens in U. S. A. for Ford Motor Co. each 170' long.

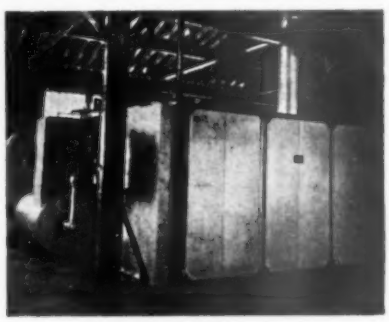


Third Continuous Monorail Core Oven for Eclipse Aviation, Bendix Aviation Corp. 27' wide, 78' long, load capacity of 10½ tons per bake.

Three Outstanding Carl Mayer Vertical Ovens at General Steel Castings Corp. Each oven 67' high, 80 tons per bake, per oven.



Part of large Carl Mayer Recirculating Gas Fired Rack Type Oven installation at The General Electric Co.



Car Type Mold or Core Oven with lift door as installed at Ford Motor, General Steel Castings, U. S. Steel Corp.

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Aluminum Co. of America
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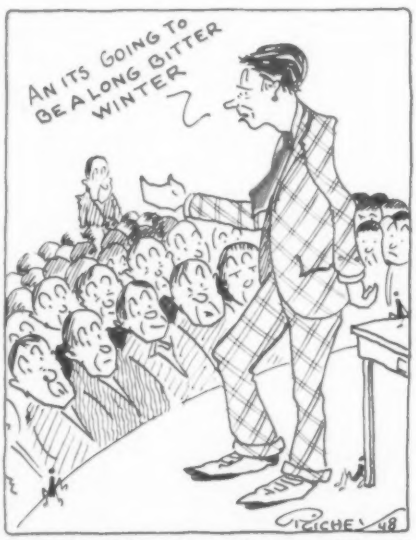
H. B. Salter Co.
Shenango Penn Mold Co.
Studebaker Corp.
Union Brass & Metal Mfg. Co.
A. C. Williams Co.
Whiten Machine Works
Whiting Corp.

(*Continued from page* 202)

of the mold to the cleaning room, and basing an opinion merely on the evidence submitted, we are inclined to agree with you, that the chills are primarily responsible for the defective casting. This is one of the instances where the casting has to be poured hot and fast. This theory to some extent is supported by the fact that the smaller castings, presumably poured in much shorter time than the large castings, have not developed any cracks.

In your experience, of course, you have noted that metal begins to lose temperature and fluidity the instant it enters a mold. A thin film forms on the surface. Although the gating method is not to blame for all defec-

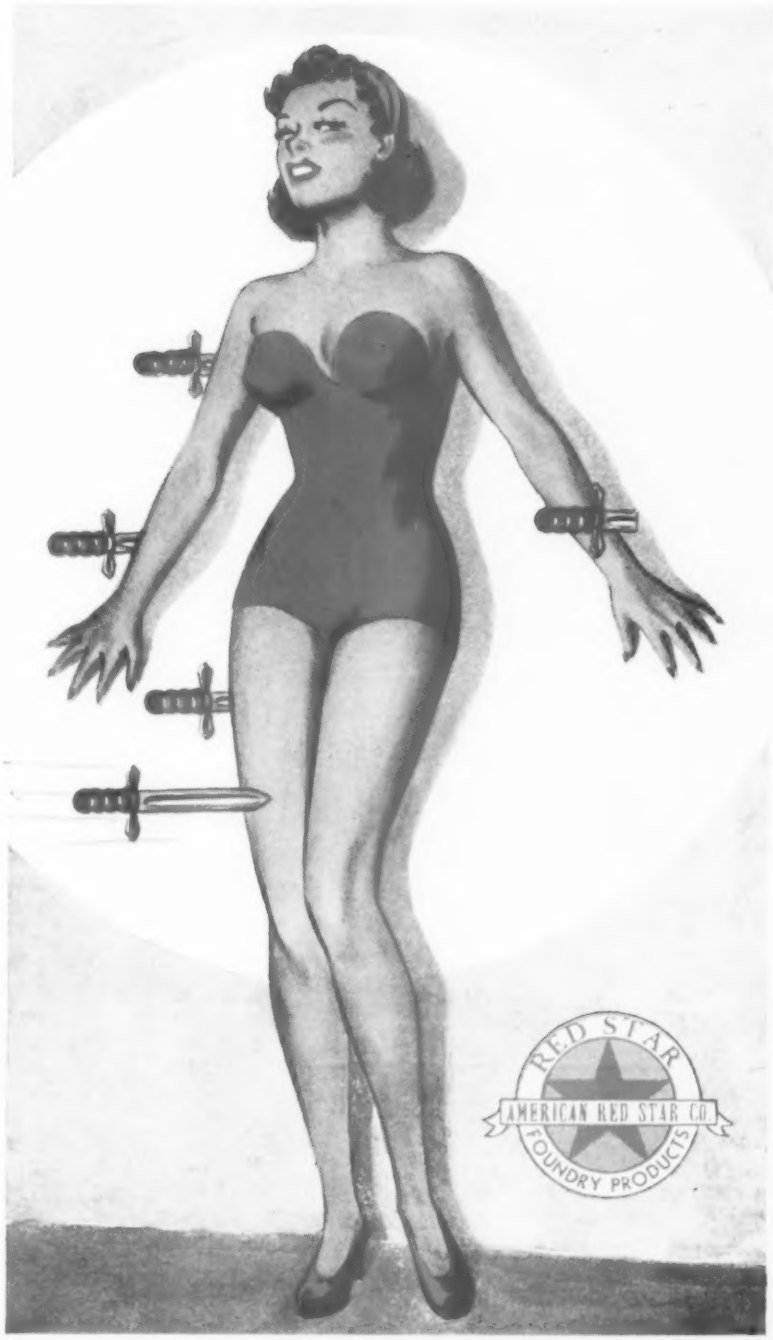


Sometimes he almost believes himself

tive castings of this kind still it is an important factor and must be adjusted to function harmoniously with the other factors, usual and unusual, connected with the production of chilled castings. On a first attempt where the casting is gated in the usual manner at the end or at the side, the face of the casting in contact with the chill will show a rough, irregular surface. The molder will feel inclined to blame the coating material and will change day by day from one to another until he has exhausted the usual range, including blackwash, plumbago mixed with machine oil, kerosene oil or gasoline, soapstone, white or blue chalk, alcohol and shellac.

After exhausting the washes without finding relief, he will decide to pour the mold (a) on a slant; (b) on edge; and (c) on end. Usually in each case the trouble is accentuated rather than diminished. In some instances part of the trouble may be due to the wash or coating placed on

(*Continued on page* 208)



SHE HAS TO TAKE CHANCES
YOU CAN BE SAFE
USE "RED STAR" CORE OILS

Leave Nothing to Chance—
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American Red Star Company's staff of practical foundrymen will always welcome the opportunity of demonstrating the merits of "Red-Star" Core Oils in your own plant. Most exacting laboratory controls make these synthetic resin type core oils a pleasure to work with.

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fast, thorough

sand MULLING

is accomplished only by

SPEEDMULLOR

action . . .

At Betz Foundry Company, Grand Rapids, Michigan, a No. 50 Speedmullor mulls a 7½ cu. ft. batch of sand in 1½ minutes—with one operator. Compare this with the old mixer at Betz that required 15 minutes per batch and three men for the operation. Such figures are typical of all foundries where Speedmullors have replaced other types of mixers.

Speedmullors are furnished with or without skip hoist; air cooling; fines removal. For the ultimate in production and efficiency, they are equipped for completely automatic operation, loading, mulling, fines removal, cooling and discharging. There are six sizes to meet the exact requirements of every foundry—large, medium and small.

THE SPEEDMULLOR MULLS NOT MERELY MIXES

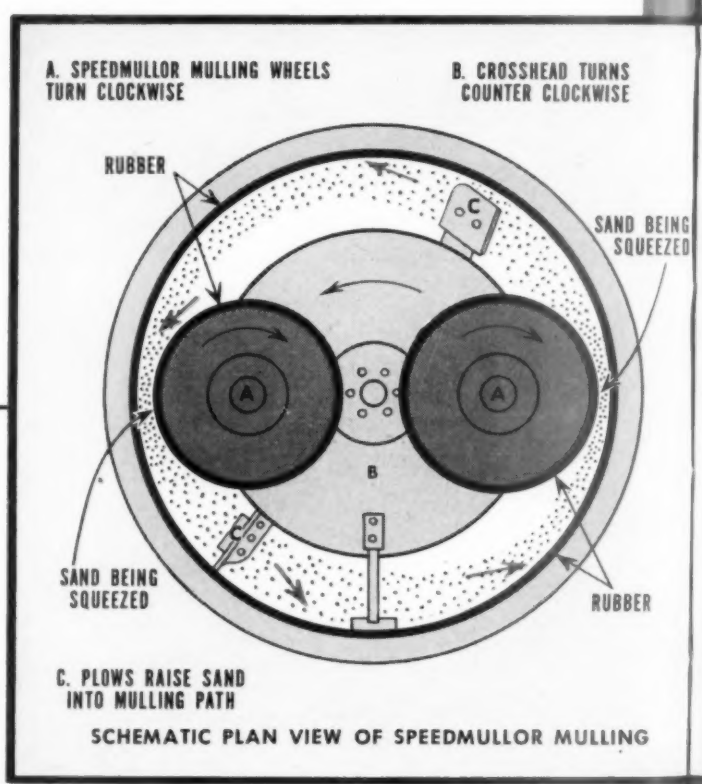
The positive turning of the rubber-tired mulling wheels, the application of uniform pressure on the sand between the wheels and rubber-lined side wall (as shown in diagram), and the rapid agitation which keeps the entire batch of sand constantly in motion, *assure* the most complete and thorough distribution of all water and bonding materials.

SPEEDMULLOR SPEED

The Speedmullor is 4½ times as fast as any sand mixing unit. It thoroughly and uniformly mulls all types of sand, even sand containing the highest bond or oil additions in 1 to 1½ minute cycles.

SPEEDMULLOR ECONOMY

Better quality sand and faster mulling results in savings in mold production and in castings. The Speedmullor thoroughly mulls sand at the *lowest* cost per pound of sand mulled, including maintenance.



SCHEMATIC PLAN VIEW OF SPEEDMULLOR MULLING

***THESE FOUNDRIES . . . AND MANY OTHERS USE* SPEEDMULLORS:**

Ohio Steel Foundry Co., Elmira Foundry Co., The Prescott Company, Standard Foundry Co., Chapman Valve Manufacturing Co., Spring City Div. of Grede Foundries, Inc., Ferguson & Lange.

WRITE FOR CATALOG!

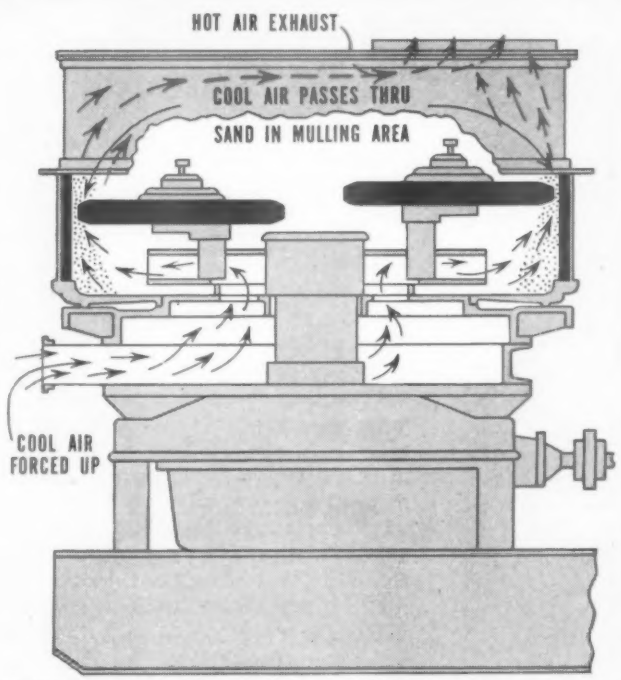
B P

THE SPEEDMULLOR COOLS SAND PROPERLY

The *exclusive* design of the Speedmullor provides *the only method* for the passage of air *through* the entire batch of sand as it is mulled. *Only in a Speedmullor* can hot sand be cooled to within 10° of room temperature without loss of sand output. The diagram below shows how cool air is forced up from the bottom of the bowl—into the mulling area—*through* the sand—rapidly dissipating the heat and removing it from the mullor.

THE SPEEDMULLOR COOLS SAND QUICKLY

Speedmullor sand cooling is faster and more positive than any other method. *It cools as it mulls* in the 1 to 1½ minute cycle. It also aerates the sand as it mulls. Speedmullor mulled sand requires no further aeration and is absolutely uniform in quality and texture. The speed and thoroughness of Speedmullor cooling *cannot* be equalled.



SCHEMATIC SECTIONAL VIEW OF SPEEDMULLOR COOLING

fast, positive sand

COOLING *is*

accomplished only by

SPEEDMULLOR

action . . .

At Fairbanks, Morse & Co. foundry, Beloit, Wisc., 3 Speedmullors produce 470 tons of sand per day. Their No. 80 Speedmullor, serving a production unit (batch capacity of 20 cu. ft.) thoroughly cools and mulls over 320 tons of sand per day in 1½ minute cycles. A No. 50 Speedmullor (batch capacity 7½ cu. ft.) serves the miscellaneous molding floors. It too, cools and mulls during a 1½ minute cycle—about 100 tons per day. A No. 40 Speedmullor in the Fairbanks-Morse non-ferrous foundry has a batch capacity of 5 cu. ft. and mulls 3 types of sand averaging 50 tons per day. Speedmullors *are* by far the most efficient in thoroughness of mulling and cooling. They do both jobs in extremely shorter cycles than by any other method!

THESE FOUNDRIES . . . AND MANY OTHERS USE* SPEEDMULLORS *WITH COOLING:

Commercial Steel Castings Co., Allis-Chalmers Mfg. Co., Union Steel Castings, National Transit Pump and Machine Co., The Medart Co., Ace Foundry Ltd., Keokuk Steel Castings Co., McNally Pittsburg Foundries, Inc., Ottumwa Iron Works, Dodge Steel Co.

BEARDSLEY & PIPER

DIVISION OF PETTIBONE MULLIKEN CORPORATION

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MANUFACTURERS OF THE SANDSLINGER • SPEEDSLINGER • HYDRA-SLINGER
SPEEDMULLOR • SCREENARATOR • MULBARO • JUNIOR NITE-GANG • PREPARATOR
CHAMPION SPEED-DRAW • PLATE FEEDERS • TURNTABLES • GYRATORY SCREENS

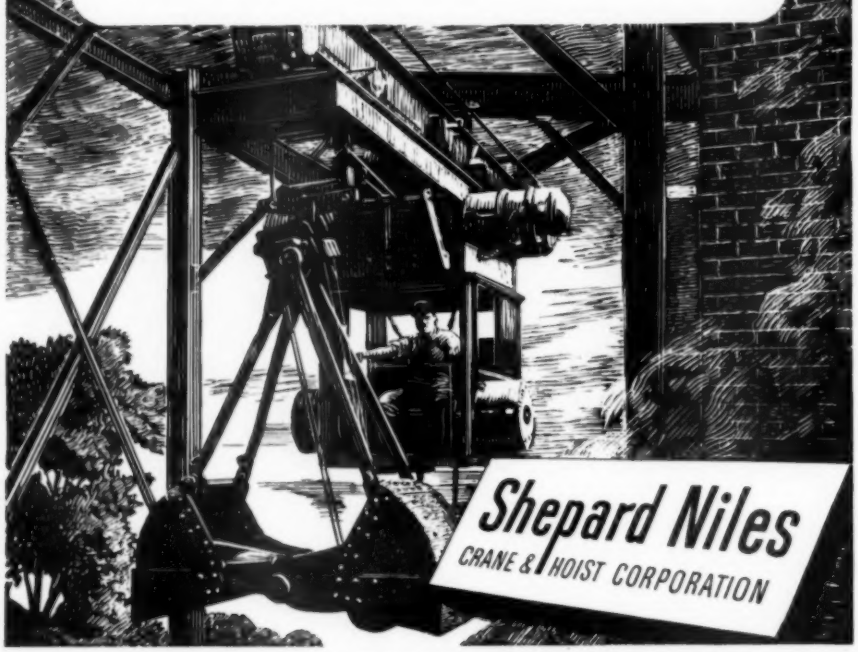
Going on a TRIP?

By motoring standards a trip of less than 100 feet is ridiculous, yet one such trip involving the moving of heavy materials around your plant by human muscle can easily cost more than a coast-to-coast automobile tour.

When material-moving costs must be kept down, when speed is important, when safety is concerned and when day-in, day-out, trouble free operation is required — the answer is a Shepard Niles monorail hoist. And the recommendation of a trained, experienced Shepard Niles engineer is invaluable in helping you get the electric hoist best suited to **your** needs.

His survey of your material handling puts you under no obligation. America's oldest builder of electric hoists has a wealth of experience from which to draw. All this experience is at your service, to help you get what you need.

★ Perhaps your problem involves an overhead traveling crane, rather than a hoist. If a crane will do a better job for you, that's what Shepard Niles engineers will recommend.



Shepard Niles
CRANE & HOIST CORPORATION

382 SCHUYLER AVENUE • MONTOUR FALLS, N. Y

(*Continued from page* 205)

the face of the chill. Only slight foundry training or experience is required to warn the operator of the danger incurred where molten metal is poured over a damp surface, a surface sufficiently impervious to cause all generated steam to pass through the molten metal. In extreme instances of this kind, the resulting explosion has been sufficiently severe to blow all the sand out of the cope.

Assuming that the coating is not the cause of the commotion, the ridges and general irregularity of the casting surface result from the fact that the metal solidifies instantly when it comes into contact with the chill. The iron immediately following has to climb over a ridge only to form another ridge and so on until the entire chill surface of the mold is covered. The obvious remedy is to pour the metal fast and hot so that the chill is covered almost instantaneously. In some instances it is possible to reverse the usual process and place the chill in the cope where the metal will come into contact with it gently after previously evaporating all the moisture. The fairly thick body of metal forced gently by ferrostatic pressure against the chill face in the cope will lie quietly and produce a smooth face.

If this plan is not feasible and the chill has to occupy the bottom of the drag, satisfactory results may be attained by providing a multiplicity of gates through which the molten metal may be forced rapidly. The basic object, of course, is to keep the metal in rapid motion and thus prevent the momentary formation of the film which forms on the metal as it advances, with momentary stops where the film is intensified through the action of the chill. Briefly in this particular instance cold shut rings developed in the casting. Not completely through the wall and therefore invisible to routine inspection. Increased tension on the casting in service broke the thin connecting metal areas. The final puzzling feature, the breaking of the casting through the thick section of the casting, may be due to the fact that the cold shut crack was developed at this point, instead of immediately at the chill. Any of the remedies you propose would have a favorable effect. However, the real remedy is to prevent the formation of cold shuts. That is done by keeping the metal in rapid motion over the chills. As an added precaution the metal, at a higher temperature than usually considered necessary for this type of casting, should be poured through

more and larger gates than usual.

As a passing observation we do not think your present light chill sections will have any appreciable effect on a casting, presumably soft and machineable. A better method —if your customer has no objection —is to attach hard iron liners to the inside of the casting. Alternatively, the liners can be attached to the core. Tapered holes in the liner, or projecting knobs, will anchor them in place in the casting. Obviously they must be perfectly clean and dry.

PATTERNS, MOLDING METHODS FOR STEEL CASTINGS

(*Continued from page* 95)

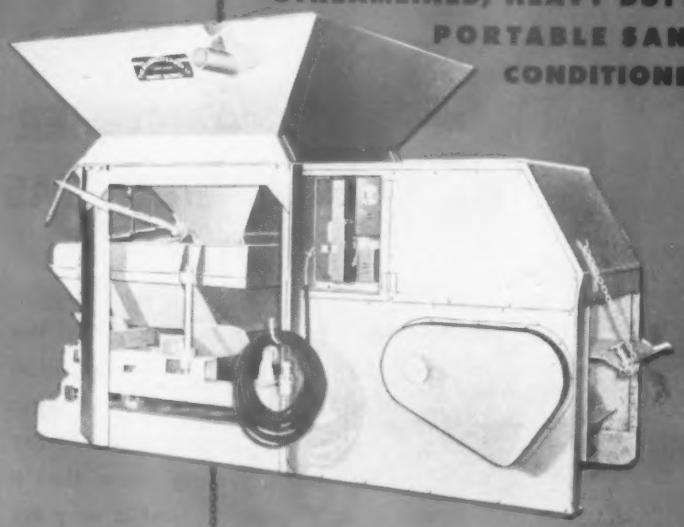
of the ramming in a horizontal direction. Obviously, when the drag is made against a false cope, all the ramming can be done downward against the pattern, and the chances of having soft-rammed places in the mold are largely eliminated. A false cope can be employed, however, only when the flasks, or at least the drag and the pattern, can be lifted and rolled over. For this reason the method is not applicable when the weight to be raised is beyond the capacity of the cranes or hoists in the shop. In bedding-in, on the other hand, only the cope need be lifted and, as already described, the drag may even be rammed in the floor of the shop, without using a flask. As the copes may then be made in two or more pieces, comparatively heavy jobs can thus be produced in shops not provided with cranes of large enough capacity to handle very large flasks.

Both bedding-in and molding with a false cope permit molds to be made from patterns so shaped that it is difficult to split them on a single plane for hand molding on a flat board. When a considerable number of such castings are to be molded by hand, and the flasks required are light enough to be rolled over, it usually pays to substitute a follow-board for the false cope. This is a heavy board, flat on one side, and provided on the other with suitable recesses into which the pattern fits. This surface of the board is shaped as the parting line of a bedded-in or false cope job would be. The follow board is thus a sort of permanent false cope, and saves the time and cost of ramming up a new false cope and making a complicated parting for each mold.

In use the drag flask is clamped to

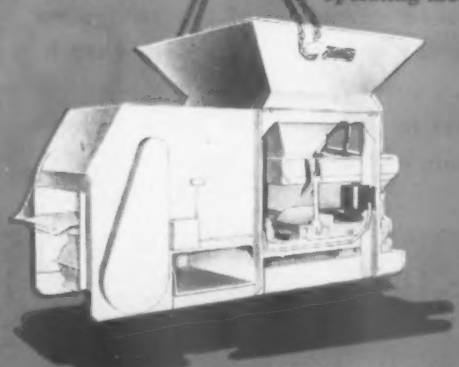
the new PREPARATOR

STREAMLINED, HEAVY DUTY, PORTABLE SAND CONDITIONER



Load centered trunnions on the Preparator provide perfect balance when moving the machine by crane to desired locations. The rigid construction of the frame assures normal operation of the machine even though it is placed on irregular or uncleared foundry floors.

The Preparator will do a complete job of preparing and tempering your molding sand! It thoroughly screens, breaks lumps, magnetically separates and aerates. Designed to best withstand the most severe conditions to which equipment of this type is often subjected. Heavy dust tight enclosures provide maximum protection to the operating mechanism.



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the follow board with the pattern in place, and is then rammed full of molding sand and rolled over. On removing the follow board, the pattern is left in the sand of the drag, ready for applying parting sand and setting and ramming up a cope, in the same manner as if the pattern had been bedded in, or a false cope made and a drag rammed on it.

When the follow-board is very large and heavy, so that it would be difficult to lift and roll over both the board and the flask, the pattern may be suspended in the drag and raised off the follow-board with the latter. In that case, as when pattern and drag are lifted off a false cope, a barred drag must be used and adequately gaggered to keep the sand from falling out when the lift is made.

Fig. 13 shows a pattern and follow-board of this sort, ready to place the drag flask. The completed drag, with the pattern in place, after lifting both from the follow-board and rolling them over, is illustrated in Fig. 14. In this particular job, the completed cope is clamped to the drag, and the whole mold is stood on edge for pouring; the parts of the pattern forming the in-gates appear at the front of Fig. 13, and the tile used to carry the metal to the in-gates is shown in place in Fig. 14. Fig. 15 shows the completed casting, with in-gates and sink-head burned off.

Pattern Mounted on Follow Board

Because of their relative weakness, shell patterns are quite often made on follow boards; indeed, as indicated previously, an ordinary pattern board used to ram up the drag of a casting made with a shell pattern is usually furnished with blocks to support the pattern and thus is practically a follow board. Patterns of that general shape, of course, can be molded either by bedding in, or by making up a false cope. Because of the difficulty of ramming sand under the concave side of such a job, it would usually be bedded in with the concave side up, and if a false cope were made, it would be rammed against the convex side of the pattern.

Instead of using a one-piece pattern and follow board, the pattern may be split along suitable lines, and each portion mounted on a separate board as shown in Fig. 16. Drag and cope are then rammed individually, each on its own board. This practice, as will be described a little further on, is the commonest method of making castings of medium and large size by means of molding ma-

(*Continued on page* 212)

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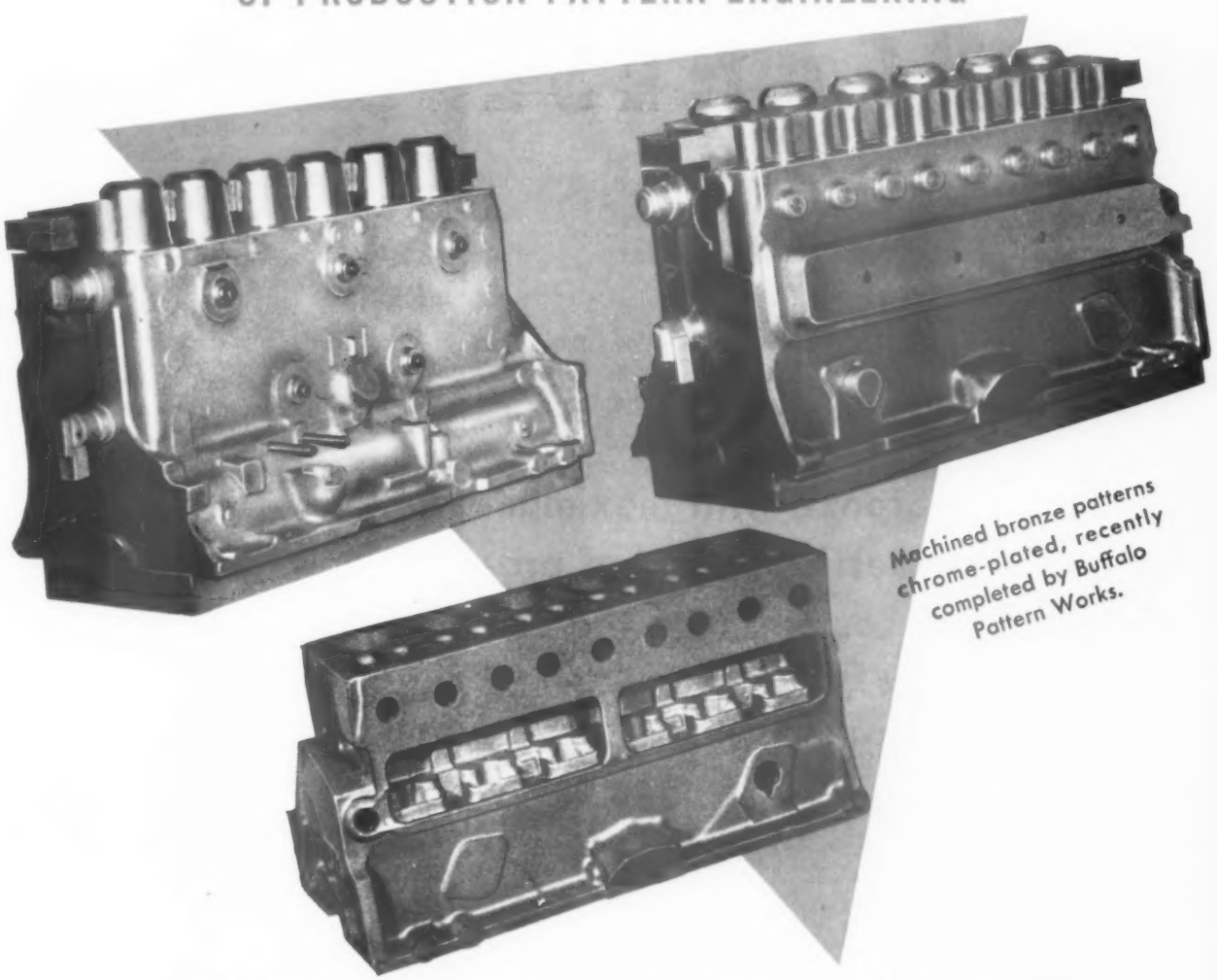

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(*Continued from page* 210)

chines. Many patterns are mounted in this manner for hand molding also, instead of using a follow board and ramming the cope on the drag. To do this calls for two boards in place of the one required when a follow board is employed, and also makes it necessary to locate the half patterns accurately on their boards, so that the cope and drag impressions will meet correctly. When a follow-board is used, the pattern need not be accurately located, since it remains in place in the drag while the cope is rammed, and thus locates the impressions in both halves of the mold properly.

Follow Board Has Advantages

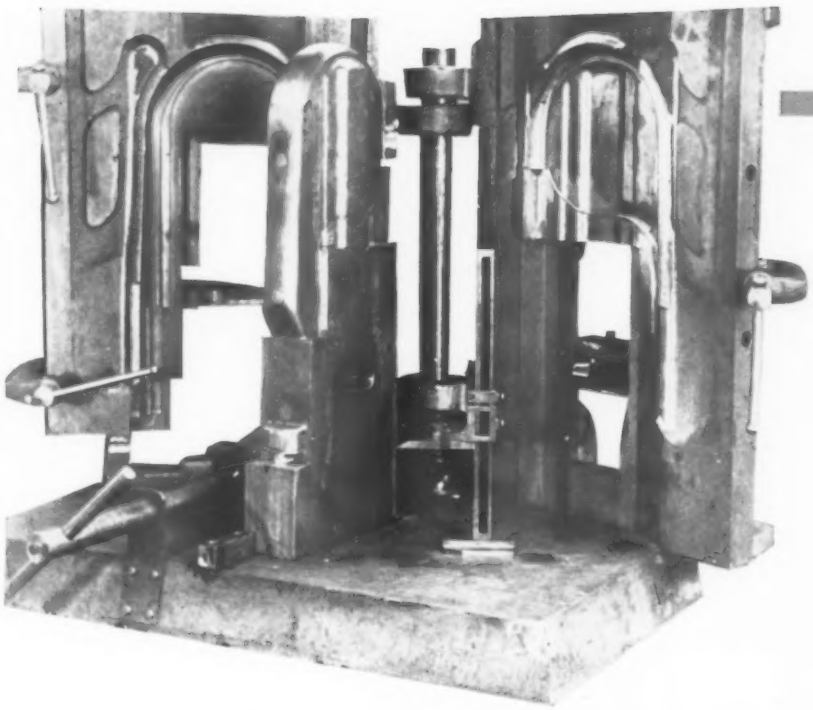
Quite often, therefore, it is cheaper and better practice to depend upon a follow board than to use half patterns, each on its own board. Of course, when two boards are used, cope and drag may be rammed up at the same time, each by a different gang, and in some cases it may be desirable to be able to operate in this way. As far as the actual cost of ramming up the job goes, however, it generally makes very little difference whether the same men ram drag and cope one after the other, or whether two gangs work on the same casting at once; the same number of man-hours will be required for each half of the mold in either case.

Since hand ramming as a rule is used only when there are relatively few castings to be made from the pattern, so that it does not pay to mount it for machine operation, it would seem quite worthwhile to make a saving in pattern cost by using a follow-board in place of cope and drag board mounting.

So far, no mention has been made of the sand cores that necessarily make up a considerable part of many molds. In modern steel foundry practice, indeed, cores are used in so many different ways and for so many purposes, that to give a really satisfactory definition of the term "core" is next to impossible. Originally, no doubt, cores were used only in making hollow objects, and the name was suggested by the fact that they shaped the inside, heart or core of the piece, like the core of an apple. Today, however, the functions of cores are so numerous that the only possible definition of the terms is based on the method by which a core is made, rather than on the use to which it is put.

Unlike molds, which ordinarily are rammed up in flasks and left in them

(*Continued on page* 214)



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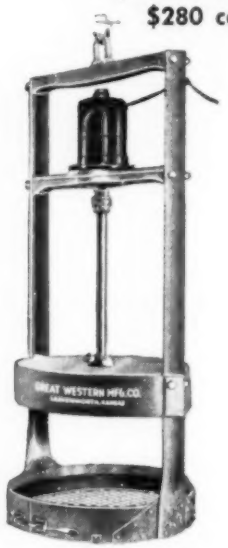

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(*Continued from page* 212)

until they are poured, cores are removed from the boxes in which they are made, and therefore have no exterior support, but must be self-sustaining. This must obviously be the case when a core is used to form the inside of a hollow object, since it must then be almost entirely surrounded by the liquid metal. To keep it in position, of course, the core must extend through the body of the casting in at least one place, and be supported by a suitably shaped portion that fits into a seat in the sand of the mold, called a core-print. To form this seat, the pattern is provided with an extra portion of such shape and size as to conform to the outline of the extension of the core. In Fig. 17 is shown a drag mold ready for the setting of an internal core, and Fig. 18 illustrates the manner of supporting the core by means of prints at three points.

Chaplets Support Cores

For additional support, metal stools called chaplets are set in the mold, with one end bearing on the core, the other on the sand of the mold, thus bracing the core securely on all sides. Chaplets must be heavy enough not to melt too early and thus fail to hold the core in place until the metal has solidified. If too heavy, on the other hand, they do not unite at all with the metal of the casting. Usually, to ensure proper functioning, chaplets are made too heavy rather than too light, and thus seldom unite perfectly with the surrounding metal.

Internal cores, of course, might be supported entirely by chaplets, were it not that gas is expelled from them by the heat of the liquid metal when the mold is poured, and this gas must be carried off by means of internal passages called "vents", which extend through the core-prints and connect with similar openings in the sand of the mold. Then, too, it is seldom if ever permissible to leave the sand of the core inside the casting, and the holes formed by the core-prints are used to get the sand out of the casting after it has cooled. The large core in Fig. 18 has the opening of a vent in the front end, and also three hook-holes, not yet closed up, in the upper surface. In Fig. 19, the large internal core for a hollow casting is shown being lowered into place in a completed drag.

Very early in the development of the art of molding, cores began to be utilized to form not only holes in castings, but also projecting portions and places that would not "draw"

(*Concluded on page* 216)

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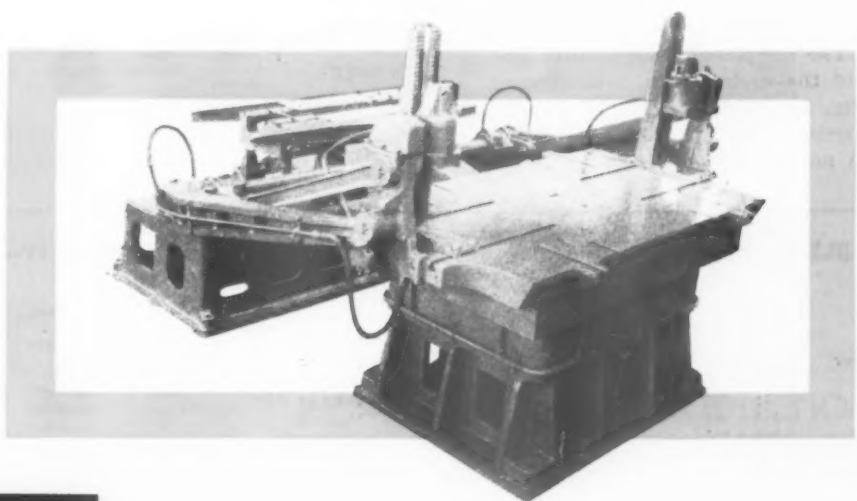

Herman **MOLDING MACHINES**

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Concluded from page 214*)

because of back-draft, and could not be taken care of in forming the parting line between cope and drag, or by means of loose pieces on the patterns. For this purpose, extra parts of the pattern were added to form core-prints, and in these were placed sand cores, provided with extensions that fitted exactly into the prints, the rest of the cores being so shaped as to form the projecting or back-drafted parts of the casting. The large pattern shown in Fig. 20, in addition to the prints for a number of internal cores, has several core-prints attached to it, to form seats for external cores of this sort. In some cases, when the outline of the pattern is such that there will be no back-draft, such cores can be rammed against the pattern itself, instead of making them in separate boxes. A part of the mold so made, and generally drawn from the pattern in a horizontal direction, though sometimes loosely referred to as a core, is better known as a "draw-back". It is necessarily so constructed and re-inforced that it can be pulled back into a space left for the purpose, and handled separately, like a core. When the mold is closed, this draw-back is set in its proper place and backing sand is rammed behind it to keep it from moving when the steel is poured into the mold.

An example of the use of draw-backs to form a considerable part of the mold for a large "speed ring", is given in Figs. 21 to 28. In the first view, the two pieces of pattern used to form the sides of the draw-back, are shown in place in a pit. The arbor for the main draw-back is shown in Fig. 22 and Fig. 23 shows it set in place ready to be rammed up. The completed draw-back on the car of the drying oven is illustrated in Fig. 24. The arbor for a secondary draw-back that lifts out of the main one, is shown in place in Fig. 25; the men in the background of this view are ramming up a second small draw-back. In Fig. 26, the pattern pieces have been removed, and a set of heavy cores, made separately in boxes, have been put in their place. The cope for one half of the mold is seen in Fig. 27, being lowered into position, while the completed casting, minus heads and gates, is shown in Fig. 28.

(*To be continued next month*)

Sources of Illustrations

General Steel Castings Co.—Nos. 13, 14, 15, 21, 22, 23, 24, 25, 26, 27 and 28.
Steel Founders' Society of America—No. 16.
Birdsboro Steel Foundry & Machine Co.—No. 19.

TRANSVERSE TEST BARS IN GRAY IRON

(*Concluded from page 71*)

verse strength to tensile strength may be seen in the graph of Fig. 10. The band of maximum and minimum properties extends over a range of 800 lb transverse strength and 14,000 psi tensile strength. For example, bars numbered 13 and 21 had approximately the same transverse strengths; however, the former had a minimum tensile strength of 25,300 psi whereas the latter had a maximum of 41,200 psi—a difference of 15,900 psi—as would be expected from their difference in carbon equivalent. Similarly, bars numbered 19 and 21 had approximately the same tensile strength, as would be anticipated from their identical analysis, but their transverse properties were 2810 and 2230 lb, respectively. This would appear to confirm the fact that unless there is a decided improvement in the character of average transverse bars, tensile strength measurements are the most accurate in predicting the physical properties of an iron.

A good correlation of properties was obtained from the simplest test, i.e., macro-examination of the fracture. Table V shows three broad fracture classifications — coarse, medium and fine — correlated with the tensile strength, transverse strength and equivalent carbon. The range of these properties for each fracture group is quite well defined. This agreement may be partially attributed to the fact that all the specimens were cut from the same size of casting, namely, the 1.2-in. diameter arbitration bar.

(*To be concluded next month*)

TABLE V—Macro-Examination of Industry Arbitration Bars

	Coarse Fracture	Medium Fracture	Fine Fracture
Tensile strength, psi	18,000–26,100	29,600–42,700	49,300–60,700
Transverse strength, lb	1,420–2,130	2,070–2,810	3,090–3,730
Carbon Equivalent, % C+1/3(Si+P)	4.59%–4.46%	4.33%–3.94%	3.83%–3.74%

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TABLE III—Summary of Transverse Bend Tests

Bar Number	Maximum and Minimum Diameter at Fracture (Inches)	Corrected Breaking Load (Pounds)	Corrected Total Deflection (Inches)	Pouring Position
1	1.284-1.267	2640	.286	Vertical
3	1.184-1.165	3730	.300	Vertical
5	1.213-1.193	3260	.320	Vertical
7	1.291-1.230	1660	.232	Horizontal
9	1.301-1.251	1620	.244	Horizontal
11	1.193-1.176	2070	.205	Vertical
13	1.232-1.214	2130	.276	Vertical
15	1.212-1.204	3520	.283	Vertical
17	1.289-1.188	2690	.262	Horizontal
19	1.187-1.176	2810	.338	Vertical
21	1.184-1.177	2230	.225	Vertical
23	1.333-1.290	1420	.218	Vertical
25	1.259-1.228	2440	.309	Vertical
27	1.203-1.188	2730	.281	Vertical
29	1.239-1.210	3090	.260	Horizontal

TABLE IV—Industry Arbitration Bars

Arbitration Bar Number	Average Tensile Strength (psi)	Maximum Tensile Strength (psi)	Minimum Tensile Strength (psi)	Max. % Deviation of Col. 3 or 4 from Col. 2	Difference Between Max. and Min. Tensile Strength (psi)
1	42,700	43,200	41,400	3.0%	1,800
3	60,700	62,800	59,400	3.5%	3,400
5	55,000	56,800	53,100	3.5%	3,700
7	19,300	20,200	18,400	4.7%	1,800
9	18,100	20,500	16,600	13.3%	3,900
11[1]	29,600	29,700	29,500	....	....
13	26,100	26,900	25,300	3.1%	1,600
15	55,300	57,400	51,200	7.4%	6,200
17	38,200	39,600	36,600	4.2%	3,000
19	42,100	42,600	41,200	2.1%	1,400
21	40,800	41,200	40,300	1.2%	900
23[2]	18,400	19,400	17,600	....	....
25[2]	30,300	31,600	29,500	....	....
27	39,600	40,300	39,200	1.8%	1,100
29	49,300	52,500	46,500	6.5%	6,000

[1] Two specimens defective. [2] One specimen defective.

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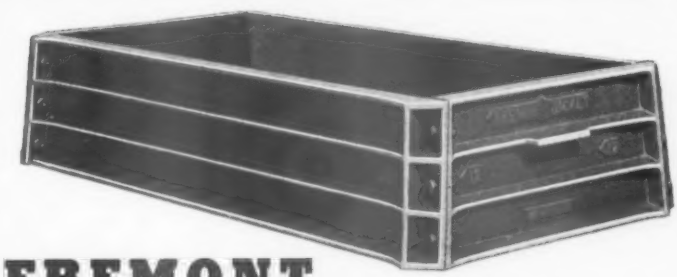

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HANDLING MATERIALS IN METAL CHARGING

(*Continued from page* 85)

piece containers. The side is a cylinder with a flange extending around the top. The cylinder rests loosely on the cone-shaped bottom which has a single hook attached to the bottom at the apex of the cone and extending up through the center of the bucket. When the bucket is suspended by the hook or is resting on the floor, the side and bottom are joined and materials may be loaded and transported. Contents of the bucket are discharged in the cupola when the flange around the top of the bucket is resting on a cast iron wishbone mounted inside the cupola. As the charger operator lowers the bottom of the bucket he may control the speed of discharge of materials by varying the opening between the cone bottom and cylindrical side. The empty bucket is removed from the cupola by raising the bottom until it contacts the side of the bucket and lifts it, along with the flange, from the wishbone support. The cupola charger then is backed out of the cupola and the bucket returned to the point of make-up where it is loaded again with another charge.

Clearance Needed for Bucket

To obtain proper distribution of the charge, a clearance of at least 10 in. should be allowed between the sides of the bucket and the cupola lining at the charging door.

Double-leaf, drop-bottom charging buckets are illustrated in Figs. 2 and 10. The two halves of the bottom of the bucket shown in Fig. 2 are hinged at the center and are held by catches located along the periphery of the bucket. Those catches are connected to a semicircular metal ring near the top of the bucket and are released by pulling a chain fastened to the ring at its midpoint.

Another type of double-leaf, drop-bottom charging bucket is shown in Fig. 10. These bottom halves are hinged at the outside and are held by a catch connected to a semicircular ring which automatically releases the load when it is brought into contact with a metal plate mounted on the inside wall of the cupola.

A single leaf, drop-bottom bucket is shown in Fig. 4. The bottom on this bucket is hinged at one point and held by a catch located opposite the hinge. Load is released when the arm on the catch is pressed against a bumper plate mounted inside the cupola. Capacity of the 48 x 48 in.

(*Continued on page* 221)

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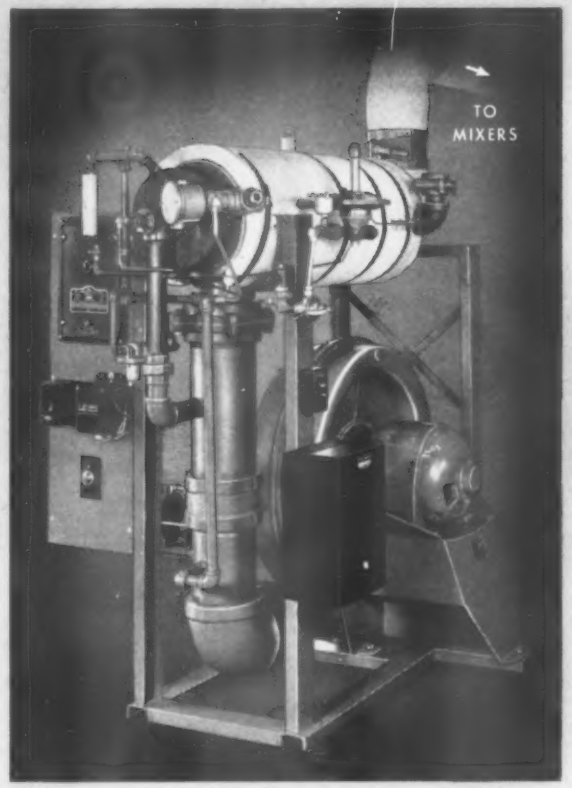

Fig. 1 – Air Heater.

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Fig. 2 – Insert Assembly and Mixer.

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The air heater shown in Figure 1 is direct oil-fired and is entirely automatic in operation and includes flame safety devices. The amount of fire at the furnace or oven burners is controlled by valves in the hot air line leading to the mixers.

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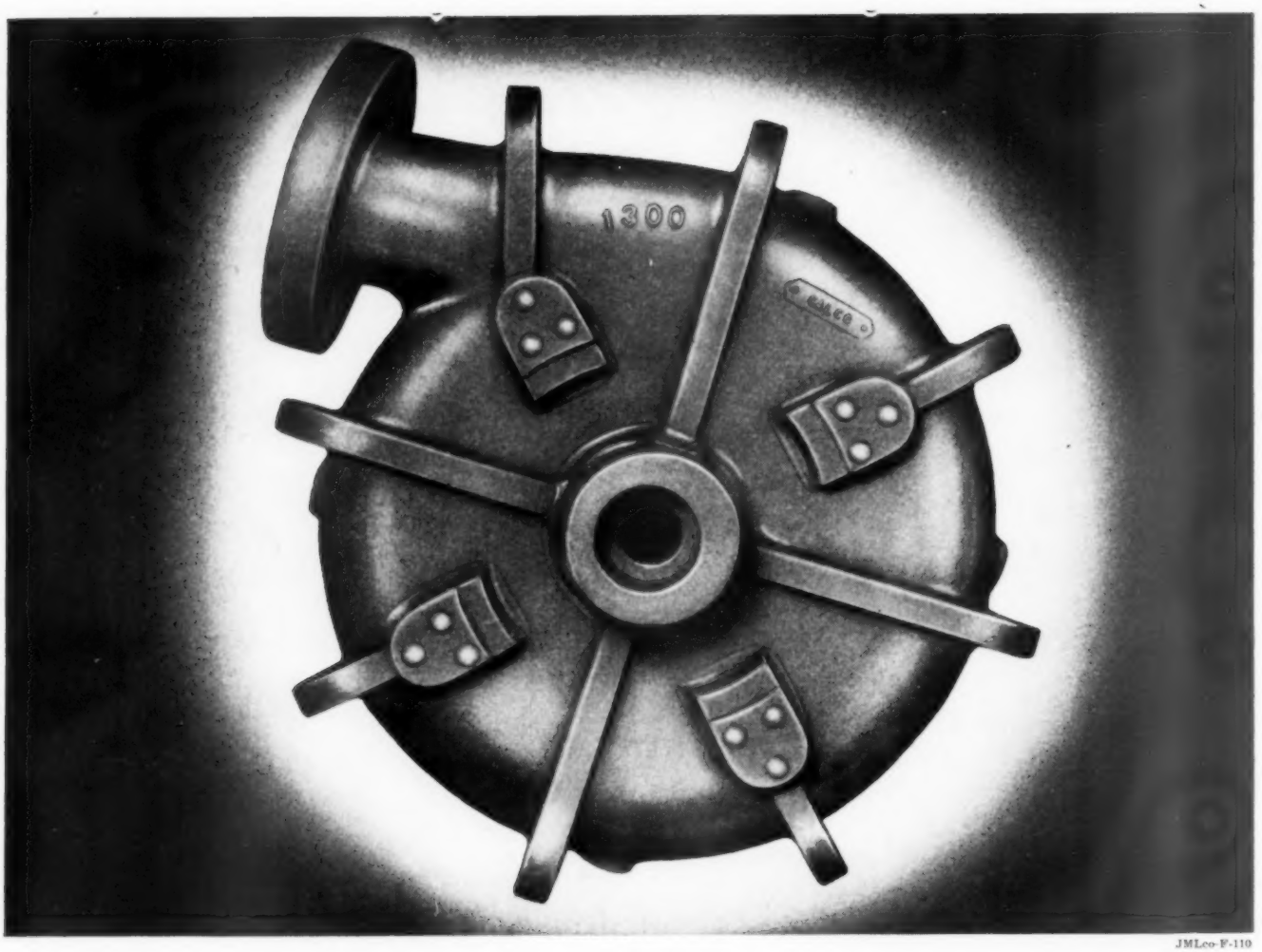

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The casing, weighing over 100 pounds, is cast by Thomas Paulson and Son, Inc., Brooklyn, New York, for the Calco Chemical Division of the American Cyanamid Company.

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Famous patented silicon bronzes offered by Federated are: Herculoy, Everdur, Olympic Bronze, and Tombasil . . . plus *all* specification alloys.

Federated's complete line of non-ferrous metals includes copper-base alloys, aluminum and magnesium alloys, bearing metals, solders, die casting alloys and fabricated lead products.

Check with your nearby Federated office for further information. Federated's metallurgical experts will be happy to help on silicon bronze or any foundry problem. Sales offices in 25 cities across the nation.

Federated first in the non-ferrous field FMD

Federated METALS

Division of American Smelting and Refining Company, 120 Broadway, New York 5, N. Y.

(*Continued from page* 218)

bucket is 2000 lb charge of metal, plus coke.

Fig. 11 shows a square-top cone type side discharge bucket of new design which has a 4000 lb charge capacity plus coke. It is designed for use on monorail or skip type cupola chargers, and is especially applicable to large diameter cupolas.

Lift trucks often are used in cupola charging operations as well as for transporting raw materials to the melting departments of iron, steel and nonferrous foundries. Fig. 14 illustrates the use of a lift truck for cupola charging. The truck is shown just approaching the charging door and carrying on its forks an open-end skid box loaded with the charge. To dump the load, the driver raises the forks until the pins at the bottom of each side of the box near the back can be engaged by the large hooks. Then he lowers the forks and the back of the box is suspended by the hooks while the front, resting on the lift forks, drops down to discharge the load.

The empty box is placed on a scale section of the charging platform which extends through a large door and juts out the side of the building above the storage yard. An overhead yard crane loads the metal into the box, which will hold a charge of up to 2000 lb. A number of these loaded boxes can be stored on the charging floor as a backlog in preparation for the day's heat. Coke is charged in a similar manner. The fork lift truck handles all movement of the skid boxes around the charging floor.

Lift magnets play an important part in making up the metal component of cupola charges. They are used extensively in conjunction with mechanical charging equipment and, as illustrated in Fig. 16, they are used for charging metal directly into the cupola. The magnet pictured is a 45-in., four-coil bolted type. However, they are available in a number of sizes and shapes—one manufac-

(*Concluded on page* 224)

A Correction

On page 228 of the October issue in the article "Combined Method for Spectrophotometric Analysis of Gray Iron," a few words inadvertently were left out in the reference to the dimethyl glyoxime solution. The passage should read—"Dimethyl Glyoxime, 1 per cent in methyl alcohol is in use, with satisfactory result."

A NEW SERVICE

We announce to pattern shops and foundries that we can now furnish pattern and core box castings without the necessity of lightening core boxes or backing off master patterns or core boxes. If you will send us your master pattern or core box or core stick, we shall be glad to quote you and supply complete information.

Photographs by courtesy of Erie Malleable Iron Company

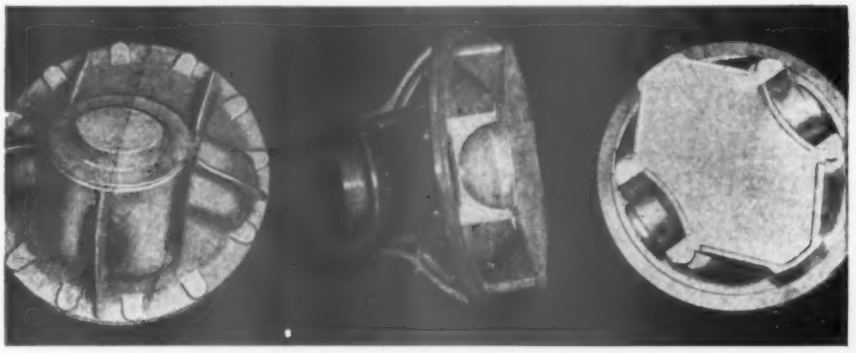
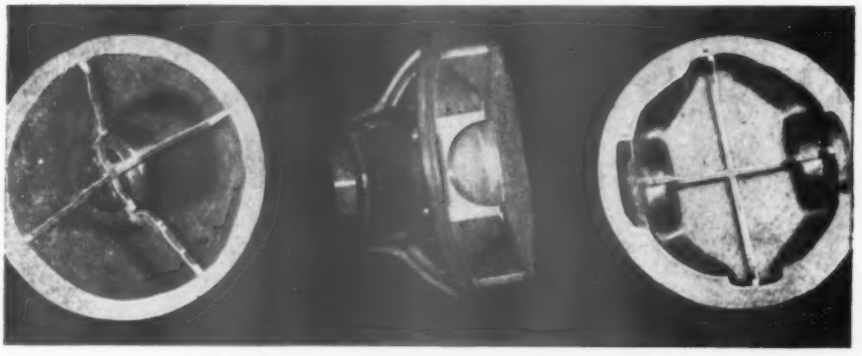


Photo shows face of pattern castings made from master pattern shown in center.



Pattern castings, showing method of lightening out.

Core box casting made from solid wood master core box, showing backing frame and method of backing off

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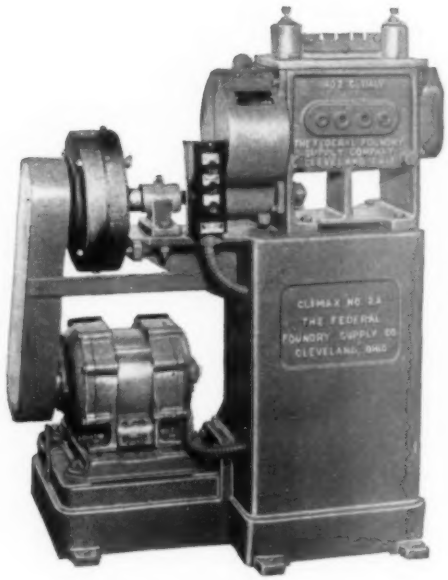
FEDERAL'S LOWE SIFTER

Save money by faster sifting, better sand conditioning with a Lowe Electric Sifter. Features: greater screening area, enclosed ball bearing motor, more shoveling room. Write for information. Prompt delivery.

CLIMAX WIRE STRAIGHTENERS



Any foundry, large or small, can cut production costs by straightening and reusing core wires and rods. With a Climax Wire Straightener this can be done quickly, economically, safely — by unskilled labor. A complete descriptive circular is yours for the asking.

The "Lightning" Clamp

The "Holdtite" Clamp

CLAMPS

Federal offers two types of flask clamps.

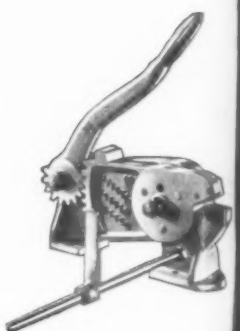
The "Lightning" clamp is an eccentric type, requiring no wedges and available in two sizes: No. 2, 8" to 12" and No. 3, 12" to 20".

The "Holdtite" is an adjustable clamp designed for use with wedges and is also offered in two sizes: No. 1, 13" to 23" and No. 0, 18" to 33".

Both clamps made of sturdy malleable iron, rigidly reinforced to prevent distortion.

FEDERAL'S WONDER CUTTERS

Two compact cutters for rods and band iron. One cuts up to ⅝" round and the other to ⅞" round. Readily mounted on any bench. Users say they're worth their weight in gold!



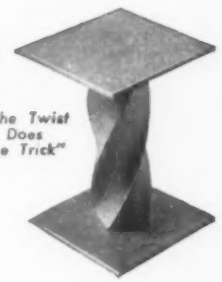
RUBBER-COVERED SHOVEL HANDLES

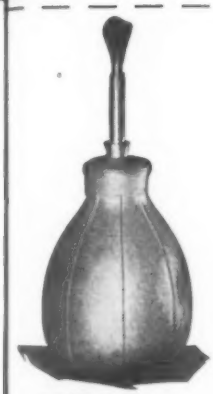
The best insurance you can buy against damaged patterns, core boxes or flasks. The pean-shaped grip is ideal for ramming.

They will fit your present shovels or you can order your next shovels with them already installed.

TWISTED STEM CHAPLETS

The chaplet with everything. The "Twisted Stem" promotes rapid complete fusion. Not deformed, the stem has no weak spot to burn in and permit core shift. Made in a complete range of sizes. Samples of the size you use, gladly submitted.





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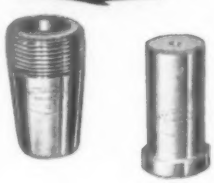
Easy to Grip and Hard to Tip. It can't leak and one fillling lasts all day. Does not tire the molder's hand.



BLAST CLEANING NOZZLES

Air consumption is reduced and the blast is concentrated because the hole in the nozzle wears very slowly. Made in all sizes and types. Write for circular.

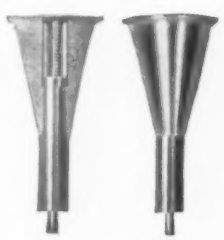
FEDERAL JOLT MACHINES

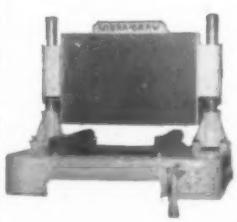
Air operated, fool-proof jolt machines that ensure uniform cores. Sturdy cast iron construction with no external valves to wear out. Made in four sizes. Get our prices and deliveries.

SHUR-SPOT SPRUE

Designed for use on squeezer-made molds, Shur-Spot squeezes right down with the sand. When the squeezer board is removed, the Shur-Spot pops up and can be lifted right out. The result is a fully completed and properly located pouring sprue that requires no finishing. Shur-Spot Sprue eliminates danger of falling sand.

For complete information on the Shur-Spot Sprue, write for the circular on this low-priced easy-to-use item.





FEDERAL'S "VIBRA-DRAW" CORE DRAWING MACHINE

Cuts costs in your core room by making it easy for every core maker to draw perfect cores as fast as he can fill the core box, place it against the vibrating head and lift the box. Made in two styles: the floor model and the portable bench model shown here. Immediate delivery — write for details.

FEDERAL VIBRATOR No. 2 and 5

Federal's own make and available for immediate delivery. Hard-chromed piston guarantees long life. For 110 volt, 60 cycle, single phase operation. $15.60 each, f.o.b. Cleveland; No. 5 for heavier duty—$20.40 each.

Federal also has a new "convenience outlet knee switch." No taping, soldering or wiring. Plug in—that's all. Carried in stock. $6.50 each, f.o.b. Cleveland, Ohio.

THE FEDERAL FOUNDRY SUPPLY COMPANY

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Overseas Commodities, Ltd., Vancouver, B. C. · Newman Foundry Supply, Ltd., Montreal, Que.

(*Concluded from page* 221)

turer furnishing round magnets in sizes from 12 to 65 in. in diameter and rectangular magnets in sizes from 25 to 85 in. long.

A versatile materials handling machine is the tractor shovel pictured in Fig. 15 removing a cupola drop. Three such machines operated by one foundry transport 2-1/2 tons of limestone and 10 tons of coke each day from storage bins to the cupolas, making a round trip from bins to cupolas of 400 ft. In addition to general haulage applications throughout the foundry, the machine can be used to shovel snow, clear gangways and perform general clean-up operations. The tractor shovel is powered by a 29-hp gasoline engine and is equipped with a 42-in. wide, 10-1/2 cu ft capacity bucket with replaceable cutting edge. The bucket and a lift fork attachment are interchangeable, and the machine employs hydraulically operated lifting and dumping mechanism. In operation the greatest portion of the load is carried by the front drive wheels, thus relieving weight on the rear wheels which are used for steering the machine.

Comparatively new in the materials handling field and also a versatile machine is the "motorized wheelbarrow" shown in Fig. 17. In the melting department it can be put to use in various time and labor saving applications. The illustration shows it hauling a load of scrap to the storage or charging yard. The machine also can be used to make up cupola and furnace charges in iron, steel and nonferrous foundries and to haul slag and refractory materials. The gear-driven unit, powered with a 3-hp, air-cooled gasoline engine, has a capacity of 1000 lb and can be equipped with a bucket which dumps mechanically, returning automatically to a normal, locked position; a platform deck with an area of 9 sq ft; or a 50-in. blade attachment which doubles as a snow plow or scraper and grader. It also incorporates a power takeoff unit.

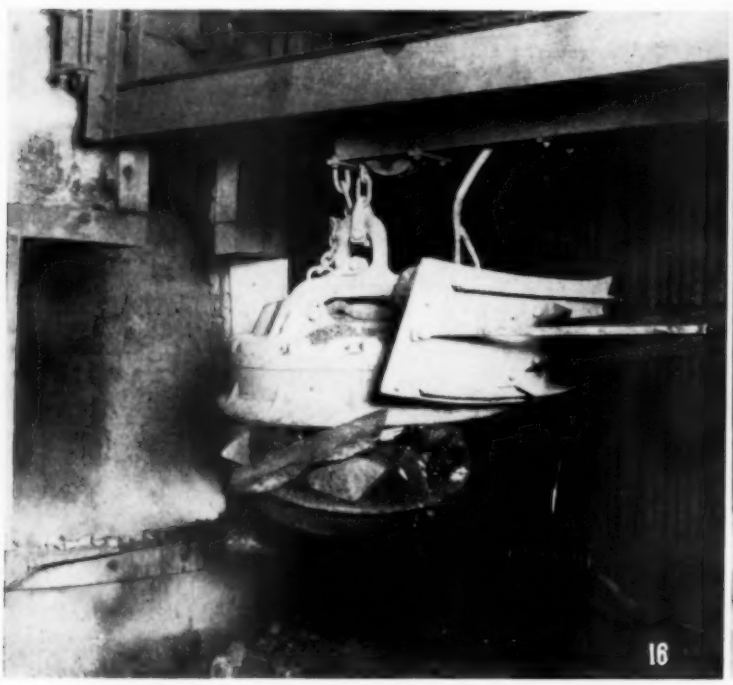
Bucket has a capacity of 10 cu ft, and the addition of sideboards increases the capacity to 18 cu ft for light materials. Bucket and platform are said to be quickly interchangeable without tools. The machine is designed to turn in its own radius, climb a 20 per cent grade and crawl through loose sand on the foundry floor.

Editor's Note: A future article in this series will deal with the movement of molten metal from the furnaces to the molds.

Sources of Illustrations

Figs. 1 and 2—Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Figs. 3, 7 and 8—American Monorail Co., Cleveland.
Figs. 4, 11 and 13—Modern Equipment Co., Port Washington, Wis.
Fig. 5—Jeffrey Mfg. Co., Columbus, O.
Figs. 6, 9, 10 and 12—Whiting Corp., Harvey, Ill.
Fig. 14—Olney Foundry Division, Link-Belt Co., Philadelphia.
Fig. 15—Frank G. Hough Co., Libertyville, Ill.
Fig. 16—Ohio Electric Mfg. Co., Cleveland.
Fig. 17—Bell Aircraft Corp., Buffalo.

Fig. 15—Tractor shovel removing a cupola drop. Fig 16—Cupola charging with a lifting magnet. Fig. 17—Motorized wheelbarrow hauling scrap



YOU'LL GET FASTER • EASIER PRODUCTION WITH A NEW AIR SQUEEZE

Moline 55 MOLDING MACHINE

THE NEW 55 HEAVY DUTY PORTABLE FEATURES A PNEUMATIC HANNIFIN CYLINDER

SMOOTH, FULL POWER PERFORMANCE

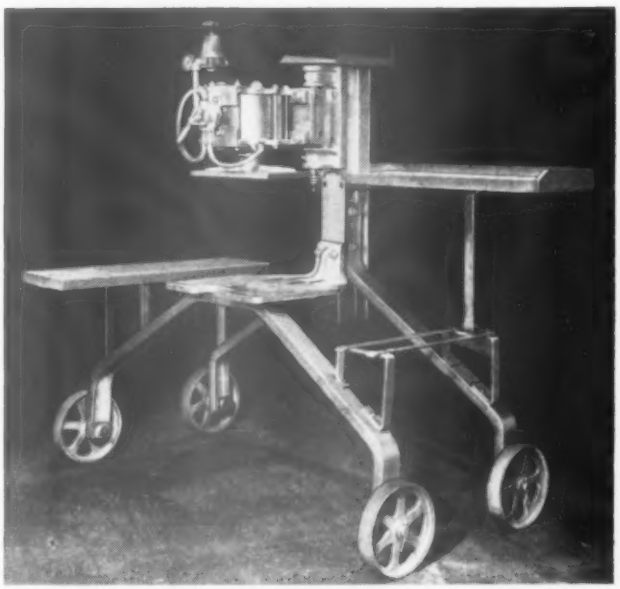
The pneumatic cylinder, pictured below, is "TRU-BORED" from steel and honed to a satin finish. Rod is ground and polished for smooth operation.

RUGGED CONSTRUCTION

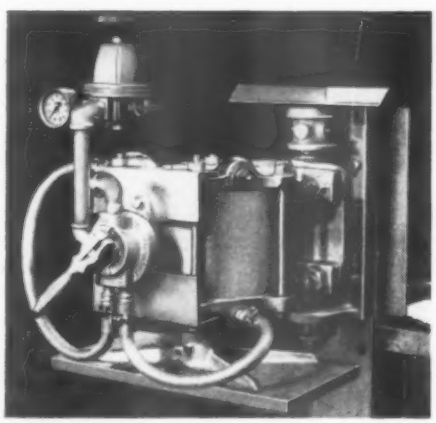
Built to withstand hardest kind of service. Heavy steel cylinder wall, provides broad seat for gasket, resists accidental blows. Machine is mounted on non-breakable, channel steel legs.

SUPERIOR DESIGN

Double cup piston featured in Series "LW" cylinders provide simplicity, economy and smooth operation.



MOLINE 55 MOLDING MACHINE WITH PNEUMATIC HANNIFIN CYLINDER



CLOSE UP VIEW OF HANNIFIN PNEUMATIC CYLINDER

INCREASES PRODUCTION

Molder can put up more molds in shorter period of time with less fatigue. Increases production and lowers foundry costs.

GREATER FLEXIBILITY

Larger flasks and heavier jobs can be handled more effectively. Easy to operate—molders all like them!

EASY TO OPERATE

Air replaces muscle in squeezing; less fatiguing. The new 55 is equipped complete with pressure regulating valve at no extra cost.

Write for further information and prices!

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We believe the best way to test the claims of any advertiser is to test the products yourself. So if you will please fill out the attached form, we will be glad to send you samples of the products you care to check.

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	HYDRO GRAPHITE ***(It's New!)*** Excellent permanent mold wash.
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GRAY IRON FOUNDERS' ANNUAL MEETING

(*Continued from page* 79)

iron and scrap also were described in detail by Mr. Collier, including efforts to prevent diversion of pig iron from foundry use through disposition of government-owned facilities. Mr. Collier reported that membership in the Gray Iron Founders' Society has tended upward the last year, at the time of the meeting standing at 586. A subsequent report by the society treasurer, Henry J. Trenkamp, president, the Ohio Foundry Co., Cleveland, showed the organization to be in its best financial condition in history.

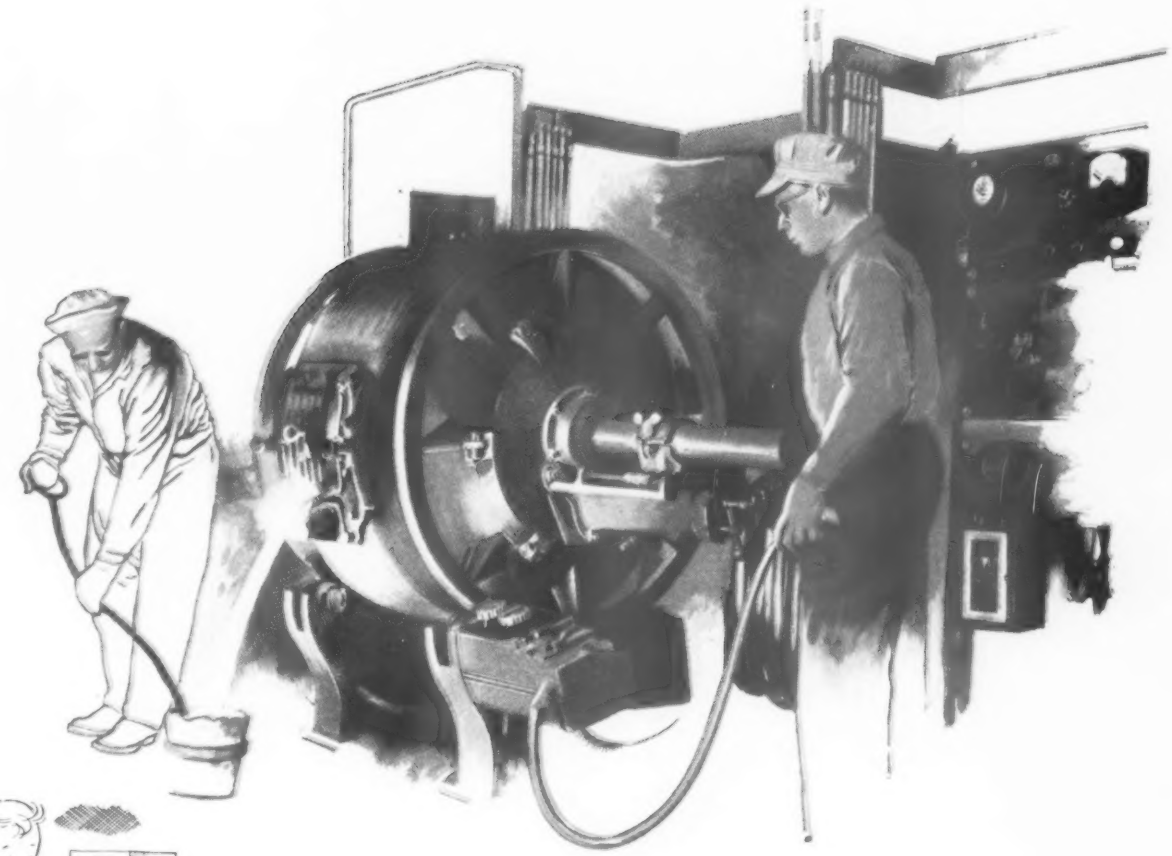
Reports of the Technical Committee, by E. B. Sherwin, president, Chicago Hardware Foundry Co., North Chicago, Ill., and the technical director, Charles O. Burgess, touched on plans for initiating, directing and encouraging developments to increase the use of gray iron and permit it to compete more effectively with other materials. An immediate project is the compilation of a gray iron castings handbook.

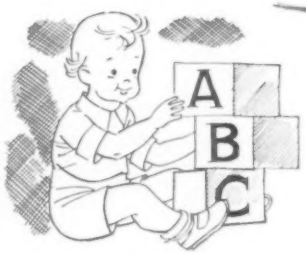
Organize Cost Groups

Speaking for the Cost Committee, of which he is chairman, Arthur E. Hageboeck reported the organization the past year of new local cost groups in New Jersey and Minneapolis. These bring the total number of individual groups to 17 with a membership of 284 foundries, or more than five times as many foundries as were represented in the four groups operating three years ago. The society's "Cost Manual No. 1," Mr. Hageboeck stated, will be supplemented in the near future by a "Cost Manual No. 2." The first manual incorporates basic principles of cost procedure which have been used and tested for over 30 years by both large and small foundries making castings in job lots and production runs. The new manual will show in detail how this basic system can be expanded to meet special cost requirements.

Peter E. Rentschler, president, Hamilton Foundry & Machine Co., Hamilton, O., and chairman of the Terms and Conditions of Sale Committee, reported that the latest revision of the form prepared by that group involved few changes compared with the previous one drawn up in 1931 but was set up in better arrangement. Like its predecessor the form was cleared through the National Association of Purchasing Agents.

(*Continued on page* 228)





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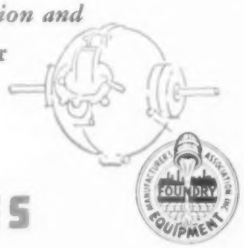
SPEED production, reduce costs and simplify operations with a compact Detroit Rocking Electric Furnace. Melting takes place in a closed chamber and heat, atmosphere, and composition are *controlled efficiently by one man.* This simplified operation assures a uniformity in the chemical composition of the metals melted, *speeds production and reduces costs.*

Detroit Electric Furnaces being electrically fired *assure uninterrupted production and are dependable,* melting both ferrous and non-ferrous heats in 'round-the-clock schedules. Detroit Electric Furnaces occupy minimum floor space. They operate cleanly and are economical in power consumption. Many models are designed for quick change of shells.

Available in various models with capacities ranging from 10 pounds to 8000 pounds. Send us details of your melting problems and *we can show you how* a Detroit Electric Furnace will *speed production and lower costs* in your operation.



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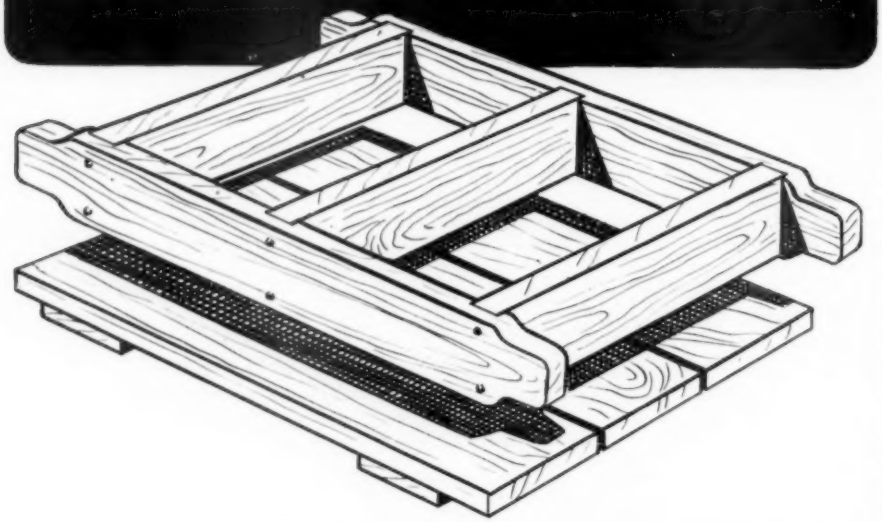
FLASK LUMBER BOTTOM BOARDS



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DOUGHERTY LUMBER COMPANY

CLEVELAND 5, OHIO — DIAMOND 1200

(*Continued from page* 226)

A brief review of recent activities of the Foundry Educational Foundation, of which the Gray Iron Founders' Society is a founding member, was presented by John M. Price, president, Ferro Machine & Foundry Co., Cleveland. Mr. Price reported on the likelihood that a seventh university participating in the FEF program will be provided in the South in the near future.

The convention heard a moderately encouraging report on the pig iron supply situation from John A. Claussen, secretary, Merchant Pig Iron Committee, American Iron and Steel Institute, New York. Mr. Claussen said that, while continued heavy demand for steel will prevent any large increase in the amount of iron available to foundries, nevertheless he is more optimistic concerning the outlook than at any time since the end of the war.

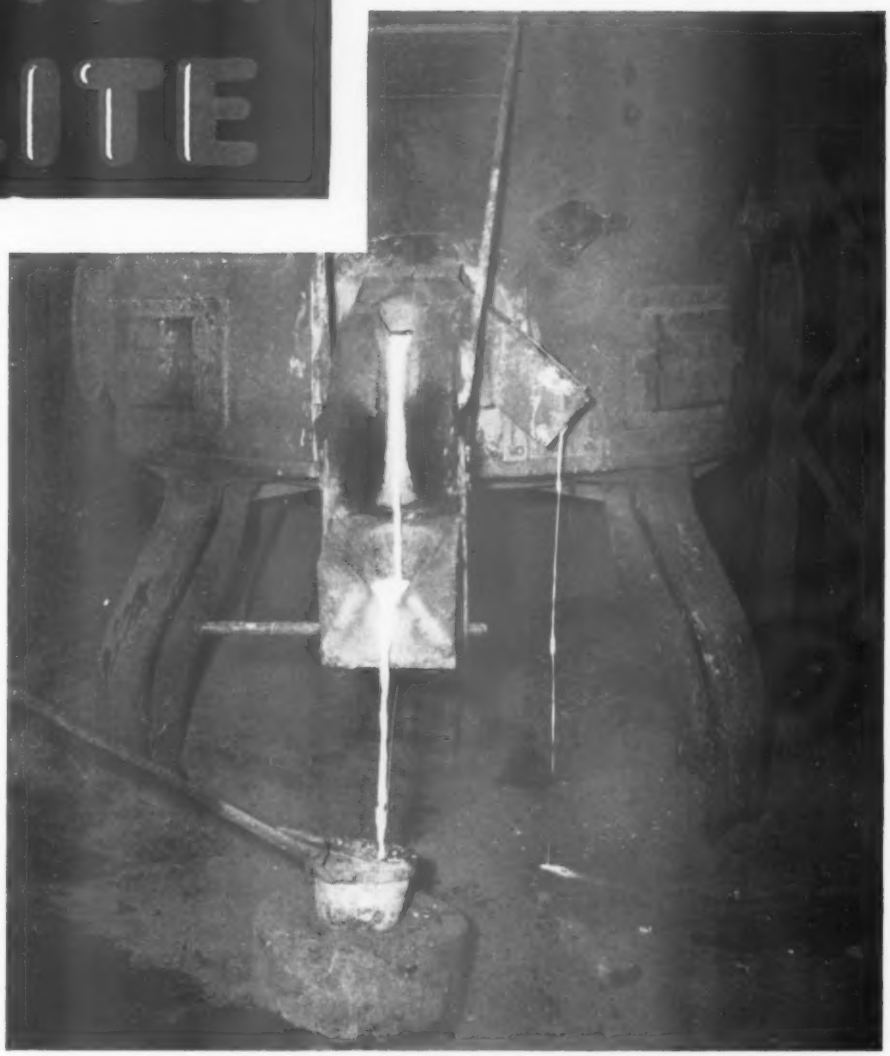
More Pig Iron Expected

He pointed out that repairs to blast furnaces have been relatively heavy this year, such shutdowns resulting in decreased iron shipments. However, with most stacks expected to be in full production by the end of the year, better operations are in prospect. Ore and coke supplies appear adequate through the winter, and the rising trend in pig iron imports—recently at 13,000 to 15,000 tons monthly—contributes somewhat to the improved outlook.

Speaking on "Profit Sharing and the Free Enterprise System," Dr. Robert S. Hartman, executive secretary, Council of Profit-Sharing Industries, Wooster, O., stated that technical research has overlooked the resources of the individual, although human resources need as much development as do natural resources. Profit sharing by industry, he maintained, can do much to expand and strengthen the free enterprise system. Describing profit sharing as any procedure under which all employees receive, in addition to good regular pay, special current or deferred sums, Dr. Hartman explained various types of plans. These include direct payments calculated as a certain percentage of the company's profits; wage dividends based on the amount of dividends paid stockholders; the stock ownership plan in which the company bears all or part of the cost; and trust plans which accumulate sums for retirement payments. Indirect payment plans include the so-called annual wage; the basing of payrolls as a percentage of sales; a sharing in cost

(*Concluded on page* 230)

IRONTON BERLITE



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Is poor quality coke and inferior scrap causing you trouble with your cupola blocks in the well and melting zone? If so, please write to us and we will be glad to tell you how to overcome it with "Ironton Berlite", super-quality refractory material.

"Ironton Berlite" is also giving remarkably good service as a ladle lining material, as a rammed tap hole, and for front slagging spouts.

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THE IRONTON FIRE BRICK COMPANY

RELIABLE REFRACTORIES

IRONTON OHIO

(*Concluded from page* 228)

savings; and the co-operative plan in which employees are both co-owners and co-managers.

With further reference to the subject of profit sharing, H. C. Nicholas, president, the Quality Castings Co., Orrville, O., pointed out that the only security we can hope to attain in this country is what is *earned* by the people—it cannot be legislated for them. He described the operation of his company's plan of sharing 50 per cent of earnings before taxes. Since this plan has been in operation both man-hour output and profits have risen, production in 1947 showing an increase of 40 per cent over that of 1940 in tons of castings per employee. Contributing to the improved record were low absenteeism (2.6 per cent in 1947), improved care of equipment with fewer breakdowns, and the interest of workers in seeking production economies and short cuts.

"Educational Program for Foundry Personnel," a talk by James H. Smith, general manager, Central Foundry Division, General Motors Corp., Saginaw, Mich., described the comprehensive training procedures practiced by that company. The overall plan includes a co-operative student program, a foreman training program, the assigning of high potential supervisors to jobs leading to more responsible positions, and weekly meetings of all management groups. Mr. Smith emphasized the value of the weekly management meetings in keeping supervisors informed on company plans and progress and better acquainted with the work and problems of other departments, as well as in promoting satety and foundry hygiene programs.

Speaking at the symposium on foundry hygiene, Dr. L. E. Hamlin, medical director, American Brake Shoe Co., said more knowledge on foundry dust is available today than ever before. Lung damage leading to silicosis is caused only by free silica, particles less than 3 microns in diameter, but there are other conditions which can cause symptoms resembling those of silicosis. Iron oxide, for instance, can act in a manner similar to silica. While silicosis in itself is not fatal, it induces tuberculosis. The best therapy for silicosis, according to Dr. Hamlin, is to eliminate all sources from which it can be acquired, meanwhile following a program of pre-employment and regular chest x-ray examinations.

Much misunderstanding exists over the extent of silicosis incidence in foundries, it was stated by Theodore F. Hatch, research director, Industrial Hygiene Foundation of America Inc., Pittsburgh. Actually, he said, no other industry where dust is a problem has made as much progress in correcting this situation as has the foundry industry. Mr. Hatch suggested that the foundry dust problems be solved by management giving it the same consideration as product quality. Size of the plant in relation to its capacity and its layout are important considerations in dust control; a good average for the former was given as 2000 cubic feet per man-ton of daily production. A point not to be overlooked is that inlets must be provided to replace air exhausted by general ventilation. The speaker also emphasized that mechanization alone will not correct dusty conditions.

A detailed review of the legal aspects of compensating for disability caused by occupational diseases was presented by Theodore C. Waters of Mullikin, Stockbridge & Waters, Baltimore. In 39 states occupational diseases now are compensable under workmen's compensation statutes, but in many states no compensation is available to the individual for partial disability. Mr. Waters suggested the general adoption of regulations which provide for partial disability benefits and release the employer from further liability in occupational diseases.

Shown at the Gray Iron Founders' Society's annual meeting, left to right, are: Edward B. Smith, American Brake Shoe Co., New York, retiring secretary; Henry J. Trenkamp, Ohio Foundry Co., Cleveland, treasurer; Howard A. Stockwell, Barbour Stockwell Co., Cambridge, Mass., retiring president; Ronald E. Kucher, Olympic Foundry Co., Seattle, retiring vice president

NODULAR CAST IRONS

(*Continued from page* 89)

for other cast irons, including an untreated iron, W.161 of otherwise similar composition to those of the nodular irons, but which had not been cerium-treated. The structure of the un-treated iron consisted of large graphite flakes in an almost entirely pearlitic matrix. The resistivities were determined on machined test bars, 0.5 in. diameter and 10 in. long, using a Kelvin double-bridge.

The electrical resistivities of the nodular irons were generally a little lower than the normal flake-graphite irons, but very much lower than the high carbon iron, W.161, of similar composition, but without the cerium addition. The cerium addition, therefore, appreciably lowers the resistivity, presumably due to the change from flake to nodular graphite.

A temperature/expansion curve was determined on each nodular iron (Table III) from room temperature to 700°C. A 2-in. long specimen was heated uniformly, the expansion read on a dial gauge, and the temperature measured on a chromel/alumel thermocouple. The variation of average coefficient of expansion with increasing temperature up to 700°C is given in Table XI.

All five irons showed an increase from 10×10^{-6} per deg. C for the 20 to 100 deg. C range to about 14×10^{-6} per deg. C for the 20 to 700 deg. C range. All five nodular irons were

(*Continued on page* 232)

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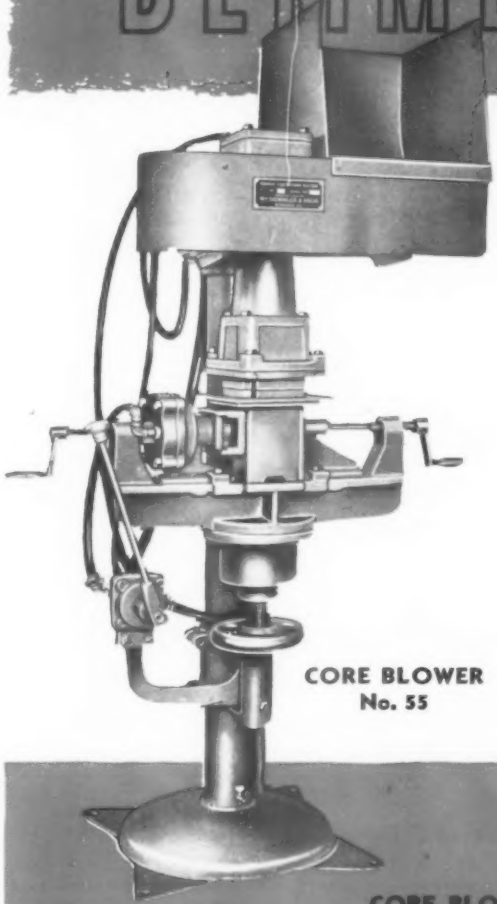

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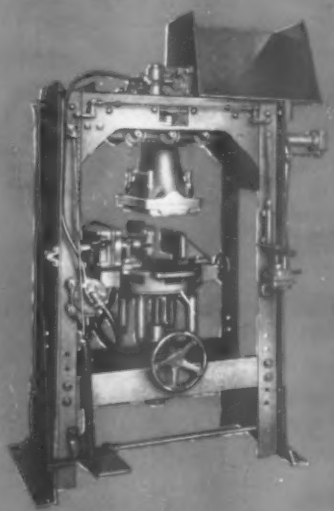
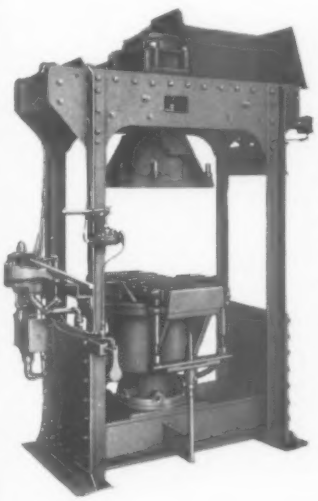
Every foundryman realizes the absolute necessity for both in these days of ever increasing production costs, and that's where DEMMLER Core Blowing Machines fit into your picture! DEMMLER machines are dependable, rugged, versatile, producing economically day after day — year after year.

At the left is the popular DEMMLER No. 55, a small core blower unequaled for blowing cores up to four pounds. Will accommodate boxes 9" long. Sand magazine and carriage are aluminum castings, mounted on ball bearing rollers for easy pushing from filling to blowing position. Machine has both vertical and horizontal air operated core box clamps, controlled automatically by the same valve that blows the core. Ideal for short run jobs. Simple in construction . . . simple in operation, the DEMMLER No. 55 has earned the praise of foundrymen everywhere.

CORE BLOWER No. 1



Well known and liked by foundrymen is the DEMMLER No. 1, at left. This is a general purpose machine for blowing cores weighing up to eight pounds, such as plumbing goods, electrical fittings up to 1½", and various small brass, malleable and grey iron castings. The No. 1 possesses quick job changing features. Chuck table is raised and lowered by a hand wheel. Chuck jaws are easily adjusted for different core box widths. Will blow either horizontal or vertical. Different size sand magazines available. Capacity: approx. 200 core boxes per hour. Many have been in continuous, profitable use for more than 25 years with only minor repairs!



CORE BLOWER No. 3E

The DEMMLER No. 3E core blower, at left, has gained an enviable reputation as a highly efficient machine for use on large cores which can be blown to advantage by attaching the top half of the core box to the blow plate and drawing the core on the machine.

An important feature of this machine is that the table height is adjustable by means of the large nut on the base, so that only as much draw is used as required.

The No. 3E is outstanding for automobile work and similar castings. The cylinder has a long center guide stem which slides in a sleeve, to insure a draw of extreme accuracy. Two hand valves operate the machine — one moves the carriage from filling to blowing position, the other raises the table, blows and draws the core. Time cycle is about 12 seconds.

Draw cylinder is 17 inches in diameter, has 10 inch stroke. Will blow cores weighing up to 35 lbs. Here is a large capacity, high production core blower with draw cylinder feature that is unexcelled in its field.

There is a DEMMLER Core Blower to meet every requirement. Let us help you with your particular needs. Illustrated specification sheets on any of the three Core Blowers will be sent upon request.

Wm. DEMMLER & BROS.
KEWANEE, ILLINOIS

MANUFACTURERS OF CORE BLOWERS EXCLUSIVELY SINCE 1911

(*Continued from page* 230)

almost identical in respect of coefficient of expansion.

Though no attempt has been made to make nodular iron piston-ring pots to meet any particular specification, a few tests have been made on rings machined from some experimental centrifugally cast hematite and Ni-resist liners. The rings were approximately of piston ring dimensions, having a diameter to radial thickness ratio of 26, and the tests were carried out to see the order of their tensile strength and E*n* value. The hematite liners were sand spun and double-treated, and the Ni-resist liners chill-spun and single-treated. The chemical analyses are given in Table XII, and the ring dimensions and mechanical properties in Table XIII. The microstructure of the hematite liner is illustrated in Fig. 34 and that of the Ni-resist liner in Fig. 35.

The tensile strength *f* and E*n* value were calculated from the expressions:

$$f = \frac{Pd}{1200\,bt^2}$$

Where P = diametral load required to cause fracture and

$$En = 14.14\left(\frac{d}{t} - 1\right)^3 \times \frac{T}{b1}$$

Where T = tangential load required to close gap,

= free gap.

The Ni-resist ring extended until it came off the knife edges of the machine, but did not break.

With one exception, the examples of nodular cast irons which have been given so far in this account have all had matrix structures of pearlite, or pearlite and ferrite. The process is, however, applicable to a wide range of alloyed cast irons, including those with austenitic, martensitic and acicular structures, and such irons always show a pronounced improvement in mechanical properties consequent upon the development of the nodular-graphite structure. Although, from the point of view of tonnage cast, such irons are of less importance than unalloyed materials, it is interesting to consider a few examples of the influence of the nodular-graphite structure upon their mechanical properties.

1. *Austenitic Cast Irons* — When the nickel content of nodular cast iron exceeds about 10 per cent, it is not necessary for the iron to be hypereutectic according to the formula: per cent C in eutectic = 4.3 − 1/3 (Si per cent + P per cent). The treatment may, therefore, be applied, for instance, to the austenitic iron Ni-resist without any modification of composition other than control of the phosphorus and sulphur contents in accordance with the conditions already set out. In Table XIV the chemical analyses and mechanical properties of untreated and single-treatment Ni-resist are given for material cast in the form of 0.875 in. bars. The untreated material had a structure consisting of under-cooled graphite in a matrix of austenite, together with a small amount of carbide. The structure of the treated bar is shown in Fig. 36 to consist of nodular graphite in a matrix of austenite with some carbide. Slightly more carbide was present in the treated than in the untreated material.

(*Continued on page* 234)

TABLE XIII.—Results of Ring Tests of Ni-resist and Nodular Irons

Material	Diameter *d* Inches	Width *b* Inches	Radial thickness *t* Inches	Tensile Stress *f* Tons/sq in.	Modulus of elasticity E*n* × 10^6 lb/sq in.	Permanent set at stress of 14 tons/sq. in. Per cent	Permanent set at stress of 21 tons/sq. in. Per cent
Hematite No. 3	3.45	0.252	0.132	47.2	21.5	8.7	12.2
Ni-resist No. 13	4.82	0.253	0.186	Unbroken	20.8	16.6	36.6

TABLE XIV.—Mechanical Properties of Untreated and Single-Treatment Ni-resist

	TC Per cent	Si Per cent	Mn Per cent	S Per cent	P Per cent	Cr Per cent	Cu Per cent	Ni Per cent	Ce Per cent
Untreated	2.76	2.68	0.45	0.027	0.024	1.74	6.74	13.24	0.045
Treated	...	...	...	0.007	....	...	...	....	0.045

	Transverse Rup. Stress, Tons per sq in.	Deflection, in.	Tensile Strength Tons per sq in.	Bhn
Treated	29.2	0.47	12.2	146
Untreated	47.4	0.86	20.3	185

TABLE XV.—Mechanical Properties of Nomag

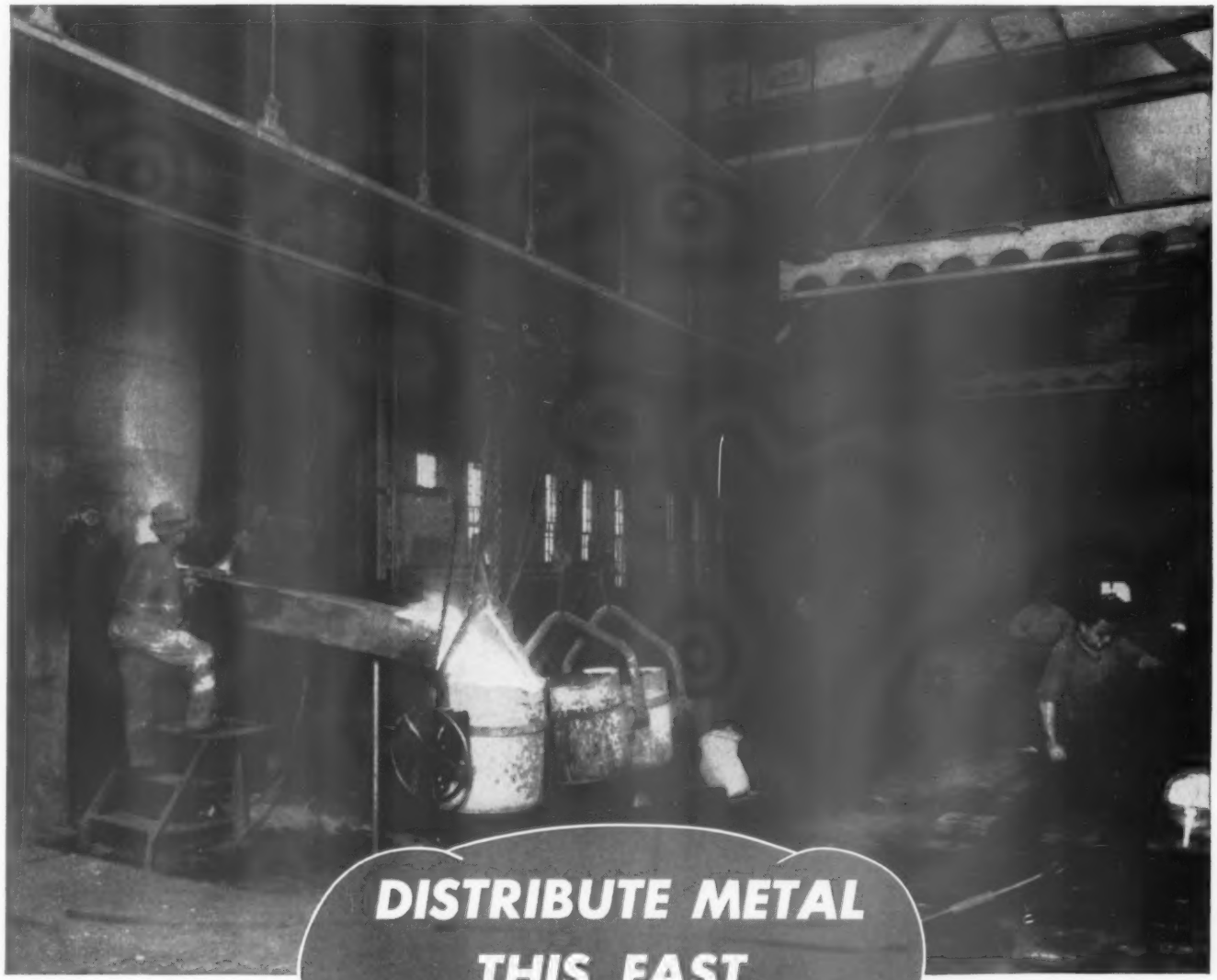
Bar Size in.	Trans. Rup. Stress Tsi	Defl. in.	Tensile Str. Tsi	Bhn	Comp. Str. Tsi
1.6	14.4	0.60	5.3	86.8	
1.2	16.5	0.80	5.9	90.7	
0.875	16.8	0.38	6.7	102	
0.6	18.8	0.32	7.3	102	59.6
Untreated: T.C., 3.28 per cent; Si, 3.08 per cent; Mn, 5.8 per cent; Si, 0.022 per cent; P, 0.072 per cent; Ni, 11.87 per cent.					
1.6	46.3	1.75	17.4	158	
1.2	46.7	2.00	16.7	156	
0.875	47.4	1.60	16.4	172	
0.6	41.7	0.65	15.8	174	86.3
Treated: T.C., 3.03 per cent; Si, 3.18 per cent; Mn, 5.9 per cent; S, 0.018 per cent; P, 0.053 per cent; Ni, 12.93 per cent; Ce, 0.023 per cent.					

TABLE XVII.—Mechanical Properties of Irons in Table XVI

Melt No.	Diam. as-cast	Trans. Rup. Stress Tsi	Defl. in.	Tens. Str., Tsi	Bhn
V.985. As cast	1.6 in.	81.2	0.45	37.1	352
	1.2 in.	72.1	0.47	39.8	401
	0.875 in.	78.2	0.30	32.5	492
	0.6 in.	63.5	0.17	Unmachinable	...
V.985. Temp. at 320° C—5 hr.	1.6 in.	77.4	0.31	47.4	373
	1.2 in.	89.9	0.47	42.6	412
	0.875 in.	90.1	0.25	43.2	451
	0.6 in.	125.1	0.28	51.7	477
W.57. Temp. at 320° C—5 hr.	1.2 in. 12 in. long 0.564 in shaped tensile	...	...	40.4	242
		...	...	46.0	285
W.79. Temp. at 320° C—5 hr.	1.2 in. 12 in. long 0.564 in. shaped tensile	...	...	50.8	335
		...	...	55.2	325

TABLE XVI.—Chemical Composition of Three Alloyed Cast Irons

Melt No.	T.C. Per cent	Si, Per cent	Mn, Per cent	S, Per cent	P, Per cent	Ce, Per cent	Ni, Per cent	Cu, Per cent	Mo, Per cent
V.985	3.58	3.07	0.80	0.008	0.040	0.038	2.04	....	0.58
W.57	3.42	2.96	0.81	0.007	0.042	0.056	....	2.51	0.64
W.79	3.32	2.95	0.82	0.014	0.031	0.059	2.15	....	0.69



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(*Continued from page* 232)

The high-manganese nickel-containing austenitic iron, Nomag, may also be treated to give nodular structures with a considerable improvement in mechanical properties. This is illustrated in Table XV, which gives the mechanical properties of untreated Nomag and single-treatment nodular Nomag. The untreated bars all had structures of coarse flake graphite in a matrix of austenite, and the treated bars had nodular graphite in austenite, plus also a small amount of carbide. The improvement in transverse rupture stress, deflection and tensile strength due to the treatment vary between 100 and 200 per cent of the corresponding values for the untreated material, and the brinell hardness number has increased by about 70 points in each case, as shown in the table.

2. *Acicular and Martensitic Cast Irons*—Nodular cast irons may be alloyed with nickel and molybdenum or with copper and molybdenum for the purpose of obtaining acicular or martensitic structures. As would be expected, nodular irons alloyed in this manner develop an extremely high level of mechanical properties which is capable of further improvement by tempering. Table XVI gives the analyses of three such alloyed cast irons, and Table XVII gives their respective mechanical properties. Material V.985, which had a metallic matrix of the acicular structure and martensite together with a little ferirte, was tested in the as-cast condition and after tempering at 320°C for 5 hr, standard test-bars being used. Materials W.57 and W.79 were

(*Continued on page* 236)

TABLE XVIII.—Composition and Tensile Strength of Nodular Irons

No.	Cast Diameter	T.C. Per cent	Si, Per cent	Mn, Per cent	S, Per cent	P, Per cent	Ce, Per cent	Cu, Per cent	Average Tensile Strength, tsi
NOD.222	1.2 in.	3.42	3.00	0.86	0.002	0.046	0.084		31.9
NOD.239	1.2 in.	3.47	2.36	0.81	0.027	0.032	0.062	2.00	37.0
NOD.242	1.2 in.	3.63	2.91	2.01	0.011	0.044	0.058		32.2
NOD.225	0.875 in.	3.65	2.97	0.54	0.027	0.028	0.036		29.8

TABLE XIX.—Tensile Strengths of Irons Detailed in Table XVIII after Heat Treatment

Melt. No.	Property	As-cast	2 hrs. 650° C	8 hrs. 650° C	2 hrs. 700° C	8 hrs. 700° C	Furnace-cooled from 900° C
NOD.222	Tensile, tons per sq. in.	31.9	29.9	29.3	29.2	28.1	27.2
	Elongation, per cent	3.0	2.0	4.0	3.5	3.0	3.0
	Modulus of elasticity, lb. per sq. in. × 10^6	24.2	24.0	23.5	24.3	24.4	22.4
NOD.239	Tensile, tons per sq. in.	37.0	34.0	30.4	29.4	28.1	28.6
	Elongation, per cent	1.5	2.0	3.0	3.0	3.5	5.0
	Modulus of elasticity, lb. per sq. in. × 10^6	23.8	....	24.4	....	....	23.3
NOD.242	Tensile, tons per sq. in.	32.2	32.2	31.6	30.4	27.6	29.2
	Elongation, per cent	1.0	1.5	1.5	1.5	1.0	3.0
	Modulus of elasticity, lb. per sq. in. × 10^6	23.4	....	24.5	....	....	22.8
NOD.225	Tensile, tons per sq. in.	28.8	27.8	28.0	29.6	....	24.0
	Elongation, per cent	5.5	5.0	3.5	8.0	....	3.0
	Modulus of elasticity, lb. per sq. in. × 10^6	23.1	....	....	....	....	21.5

TABLE XX.—Influence of Heat Treatment

Composition: T.C. 3.56 per cent; Si, 2.88 per cent; Mn, 0.54 per cent; P, 0.035 per cent; S, 0.007 per cent; Ce, 0.048 per cent.

Bar size and Treatment	Trans. Rup. Stress Tsi	Defl. in.	Tens. Str. Tsi	Bhn	Impact Str. ft lb
1.6 in., As-cast	45.1	0.43	...	...	..
1.2 in., As-cast	49.0	0.69	24.2	190	..
0.875 in., As-cast	54.6	0.35	...	...	47
0.6 in., As-cast	68.1	0.31	28.6	256	..
1.2 in., 900° C oil-quenched, tempered, 3 hr, 456° C	...	...	53.4	368	..
0.875 in., do.	...	...	55.6	363	..
0.875 in., slowly cooled from 900° C	...	...	21.0	143	..
0.6 in., air-cooled from 900° C	...	...	38.9	266	..

TABLE XXI.—Commercial Nodular Irons

Composition after treatment: T.C., 3.69 per cent.; Si, 2.77 per cent.; Mn, 0.63 per cent.; S, 0.005 per cent.; P, 0.045 per cent.; Ce, 0.057 per cent.

Test Bar Diam in.	Trans. Rup. stress Tsi	Defl. in.	Tens. str., Tsi	Bhn
3.0*	47.4	0.51	37.9	241
2.1	63.6	2.14	....	...
1.6	67.9	1.30	....	...
1.2	61.4	0.95	35.9	218
0.875	77.6	0.83	....	244
0.6	80.0	0.53	34.2	...

* Tested on 18 in. centers in transverse.

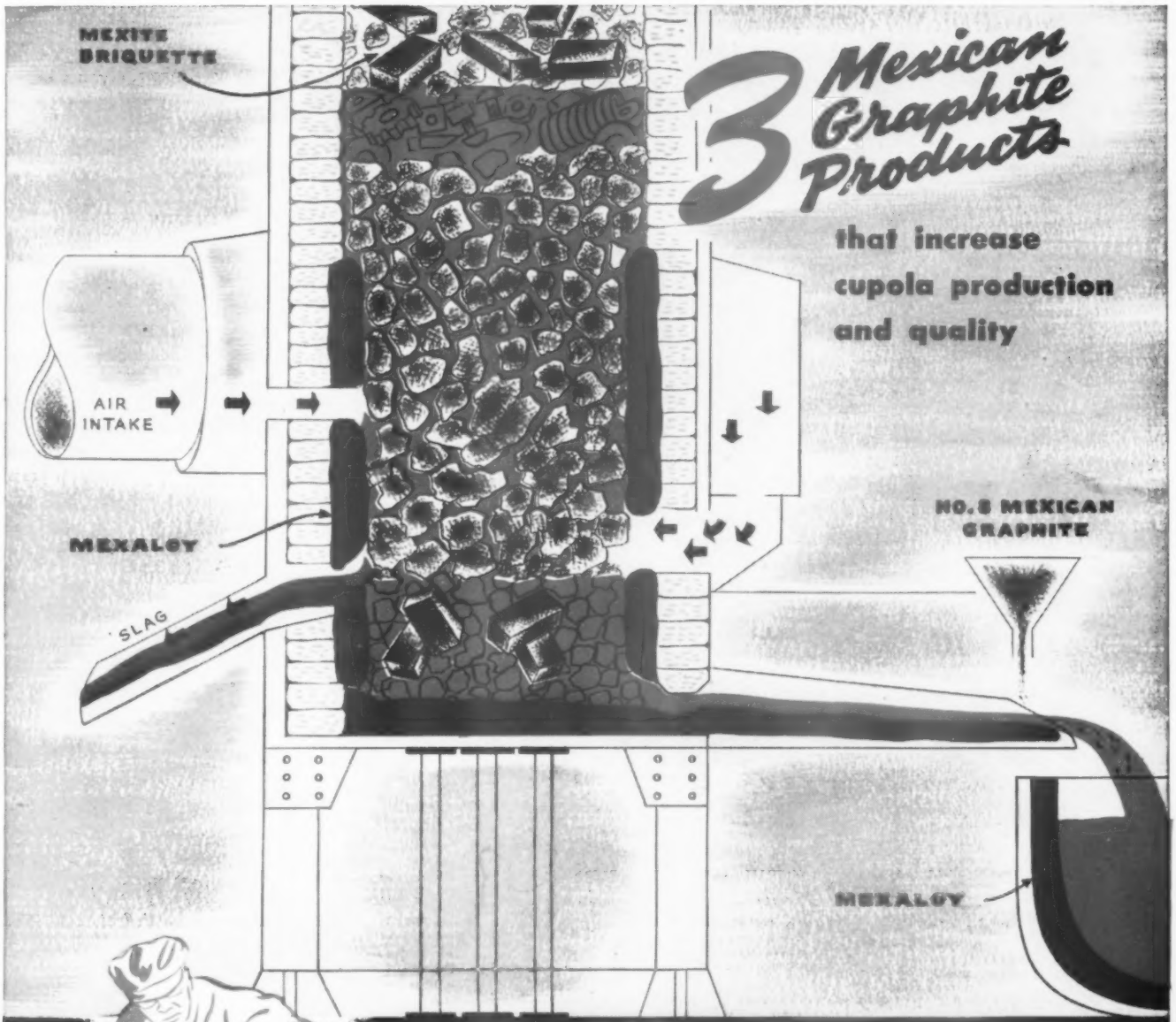
TABLE XXII.—Using Simultaneous Additions

Composition: T.C, 3.71 per cent.; Si, 2.96 per cent.; Mn, 0.54 per cent.; S, 0.010 per cent.; P, 0.033 per cent.; Ce, 0.051 per cent.

Transverse rupture stress (tons per sq. in.)	66.5
Deflection (in.)	0.60
Tensile strength (tons per sq. in.)	32.2
Brinell hardness number	241
Impact strength (ft.-lb.)	71

TABLE XXIII.—Influence of Phosphorus on Nodular Irons

No.	T.C, Per cent	Si, Per cent	Mn, Per cent	S, Per cent	P, Per cent	Ce, Per cent	Bar size, in.	Transverse Rupture stress, tsi	Deflection, in.	Tensile Strength, tsi	Bhn	Impact, ft.-lb.
1	3.78	2.67	0.52	0.018	0.024	0.040	1.6	40.0	0.30	19.8	182	
							1.2	40.8	0.35	22.3	186	
							0.875	44.0	0.27	24.0	216	35
							0.6	48.4	0.16	31.7	231	
2			0.52	0.014	0.29	0.035	1.6	28.7	0.18	17.2	192	
							1.2	34.1	0.23	17.8	205	
							0.875	38.3	0.16	20.5	229	17
							0.6	41.0	0.14	22.2	229	
3			0.51	0.016	0.47	0.024	1.6	25.6	0.18	17.0	197	
							1.2	31.2	0.23	18.2	209	
							0.875	34.5	0.15	19.6	215	14
							0.6	38.5	0.12	20.3	235	
4			0.46	0.018	0.57	0.010	1.6	19.9	0.17	10.1	159	
							1.2	21.5	0.20	11.1	172	
							0.875	25.6	0.13	11.9	200	8
							0.6	28.6	0.11	14.1	229	



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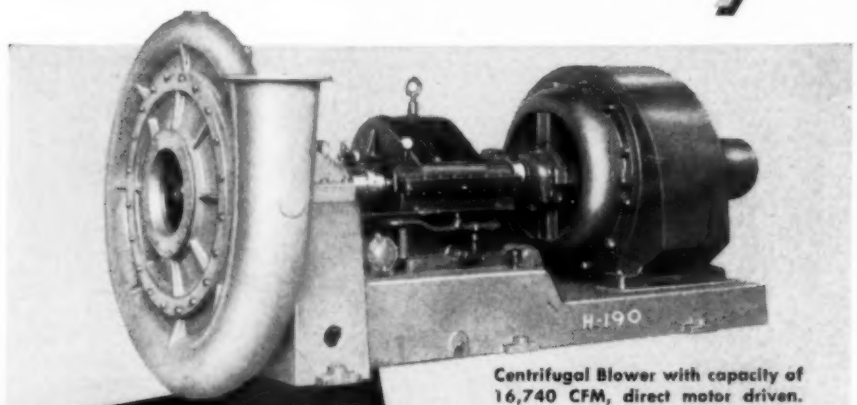

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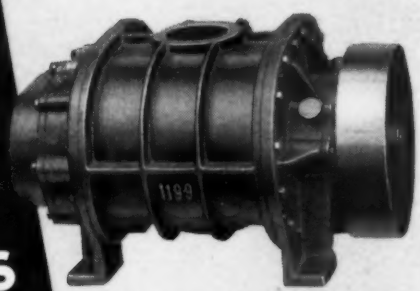

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(*Continued from page* 234)

cast in the form of horizontal 1.2-in. bars each 12 in. long and as shaped tensile bars 0.564 in. diam, and both were tested after tempering for five hours at 320°C. Material W.57 was only partially acicular, having about 50 per cent of the matrix in the form of ferrite, whereas material W.79 had a good acicular structure together with a little ferrite around the nodules. All three materials were produced by the double-treatment process.

All nodular cast irons may be subjected to heat treatment for the purpose of obtaining special structures and mechanical properties, without noticeable effect on the graphite structure.

"Dead" Annealing or Softening Annealing—The object of this form of heat treatment is usually to make the material completely ferritic and hence to obtain it in its softest and most ductile condition. Nodular irons readily respond to this annealing, the time necessary to produce the completely ferritic structure depending upon the composition and the section size—in general the smaller the section size the more rapidly does the pearlite breakdown occur, due to the finer dispersion of the graphite nodules. Un-alloyed nodular irons of up to ½ in. section and having 3.5 to 3.9 per cent Tc and 2.5 to 3.0 per cent Si can be completely "dead-annealed" by heat-treatment for about 2 hours at 700 to 750°C. The most efficacious heat-treatment for this purpose is, however, that involving heating to above the critical range, say, 900°C, followed by slow cooling in the furnace.

To illustrate the influence of annealing upon double-treated nodular cast irons the results given in Tables XVIII and XIX are quoted. These results were obtained on four different nodular irons heat-treated at 650 and 700°C for 2 and 8 hr, followed by air-cooling, and at 900°C followed by furnace cooling. Micro-examination of the annealed bars showed that considerable pearlite break-down had taken place in all cases, but traces of spheroidized pearlite remained in the bars annealed at 650 and 700°C, the amount being less for the longer annealing times. The break-down was most complete in the bars slowly cooled from 900°C.

The tensile strengths and moduli of elasticity decrease as the amount of spheroidized pearlite decreases, but there is no regular trend in percentage elongation. The as-cast bar NOD.225 has a total elongation of

(*Continued on page* 238)

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(*Continued from page* 236)

5.5 per cent, and after annealing for 2 hours at 700°C. an elongation of 8 per cent. This is the greatest elongation which has been recorded on a nodular cast iron except in the case of austenitic materials. Un-alloyed nodular irons having Si contents of 2.3 to 3.0 per cent give brinell hardness numbers of 130 to 180 when annealed to the completely ferritic condition.

Quench-tempering and Normalizing—Nodular irons respond to quenching, tempering and normalizing in a manner similar to that of ordinary gray irons. By quenching and tempering, improvements in tensile strength of up to 100 per cent may be obtained, and by normalizing, that is, heat-treatment above the critical range followed by air-cooling, improvements of up to 30 per cent in tensile strength have been achieved. The results given in Table XX illustrate the influence of quenching and tempering and normalizing a single-treatment unalloyed nodular iron. One sample of this material was also dead-annealed by slow-cooling from 900°C. The as-cast structure of this iron consisted of a mixture of hypereutectic nodules and quasi-flake graphite in a matrix of ferrite and pearlite. The quench-tempered bars had a metallic matrix of tempered martensite, the slowly-cooled bar was completely ferritic, and the air-cooled (normalized) bar had a matrix of fine pearlite.

With nodular cast irons it is possible to achieve a very high level of transverse and tensile strength with relatively low hardness figures. The shock-resistance of unalloyed nodular irons may be three to five times better than that of flake-graphite cast irons and this may be considered as the outstanding feature of the material. The problem immediately arises as to how this new cast iron can be produced commercially and on an industrial scale. Much further work remains to be done on this aspect of the problem and various possibilities have still to be explored. It is the purpose of this section of the paper to discuss some of the difficulties and possibilities with regard to the commercial production of the material.

Involves Two Primary Problems

The manufacture of nodular cast irons involves two primary problems—first, that of obtaining molten metal of the correct composition at the correct temperature, and second, the addition of *mischmetall* and a graphitizing inoculant to the molten metal prior to casting.

The composition requirements for nodular cast irons have been described in an earlier section. The most important elements for control purposes are carbon and sulphur. If a low-sulphur hematite pig iron be available, experience has shown that it is not difficult to meet the required conditions when melting in crucible, electric-arc furnaces, resistor furnaces and high-frequency induction furnaces. With such melting equipment it is possible to limit the carbon loss on melting to a very low figure, and since there is usually no sulphur pick-up it is possible to produce nodular cast irons merely by melting a pig-iron of appropriate composition and then to treat the metal after or during tapping in the ladle. These batch-type melting units are, however, among the least important melting units available in the foundry. Nodular cast irons can be produced, and successful large scale industrial tests have been conducted, using the cupola furnace.

With 100 per cent pig charges it is possible to tap hypereutectic carbon

(*Continued on page* 240)

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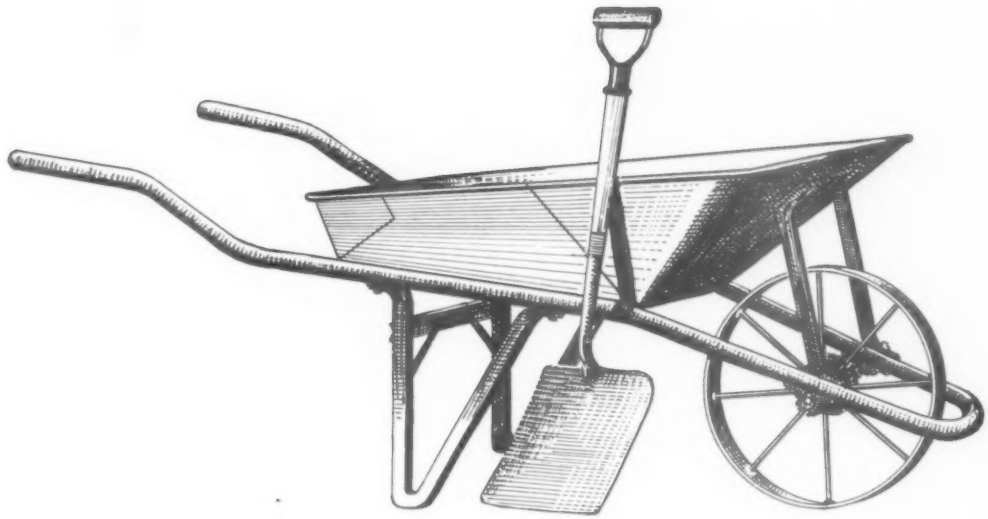

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(*Continued from page* 238)

contents, but there is always a sulphur pickup which cannot be avoided in normal practice and even though the sulphur content of the charge may be low, the sulphur content of the metal tapped will normally be too high to allow immediate treatment with *mischmetall* on an economic basis. The higher the sulphur content of the metal to be treated, the larger is the amount of cerium which is required to reduce the sulphur to the maximum permissible. For instance, with sulphur contents of the order of 0.1 per cent, an addition of as much as 0.6 per cent *mischmetall* may be require to give a final sulphur content of less than 0.02 per cent, and about 0.05 per cent cerium in the final casting. On the other hand, when the sulphur content of the metal to be treated is of the order of 0.02 per cent, only about 0.1 to 0.2 per cent *mischmetall* is required to give the same yield of cerium.

Due to the sulphur pickup in normal coupola practice, it is in general necessary to interpose a preliminary desulphurizing treatment in the ladle. If the sulphur content of the metal tapped from the cupola be within the range of 0.05 to 0.08 per cent, it may be possible to desulphurize the metal sufficiently by one treatment with soda ash in a basic-lined ladle, but if the original sulphur content be higher than 0.08 per cent, the "double ladle" technique of desulphurizing might have to be applied.

Assuming that a sufficiently low sulphur content can be obtained to warrant only one desulphurizing treatment, then the procedure required would seem to involve tapping the metal from the cupola into a basic-lined (preferable "tea-pot" type) ladle containing soda ash; after the reaction has subsided the slag may be thickened and skimmed off and the metal treated with cerium by throwing *mischmetall* on to the surface of the metal and stirring in; this could be followed by an addition of inoculant, if necessary. Alternatively, after skimming the thickened soda ash slag from the ladle the metal can be poured into a ladle containing the *mischmetall*, together with the inoculant if required.

Treated in Two Ladles

If the "double ladle" technique of desulphurizing be applied, the metal from the cupola will be run into the first ladle containing the soda ash and then the mixture poured into the second ladle in which the slag can be thickened and then skimmed off. In general this double-ladle technique can only be applied with relatively large amounts of metal, otherwise there is a serious loss in temperature. The *mischmetall* may be added to the surface of the metal in the second ladle, but if a large amount of metal is to be treated it is difficult to obtain uniform solution by stirring, and it is preferable then to place the *mischmetall* in the bottom of the first ladle and to pour the metal from the second ladle on to it. The treated metal can then be cast from the first ladle.

The mechanical properties given in Table XXI illustrate the results which can be obtained from a cupola operating under commercial conditions. All pig charges (3.87 T.C, 2.68 Si, 0.66 Mn, and 0.03 per cent S) were melted in a balanced-blast cupola and tapping temperatures in excess of 1400°C. were obtained. The metal was tapped into 5-cwt capacity basic-lined ladles containing soda ash, the slag was thickened and skimmed off, *mischmetall* was added and plunged in and then the inoculant was added

(*Continued on page* 242)

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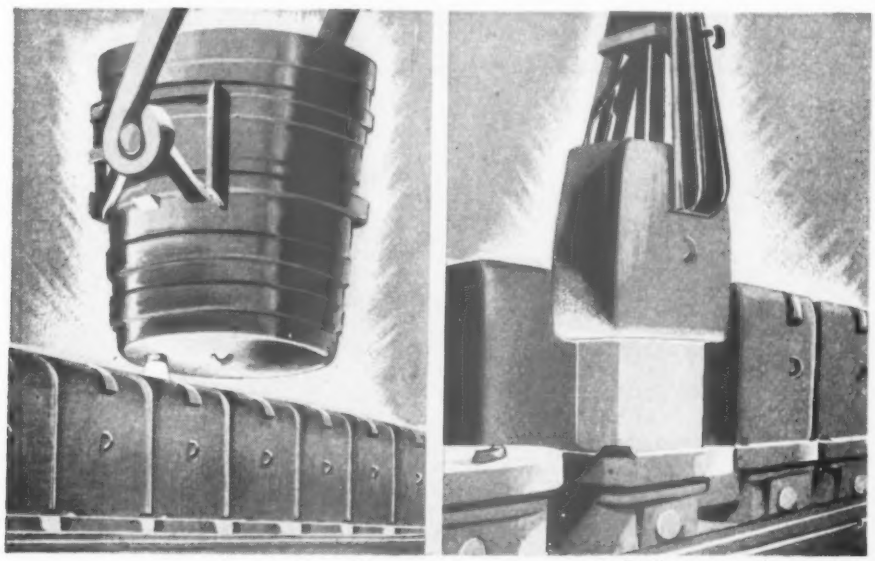

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40th Anniversary Year

Acheson Colloids Corporation

Port Huron, Michigan

(*Continued from page* 240)

and plunged in with a refractory plunger. The microstructures of all the bars of this set had nodular graphite structures.

The use of the basic cupola may provide a means of obtaining high carbon contents and low sulphur contents even with at least an appreciable part of the charge made up of steel scrap, but this furnace has not yet been tried for the production of nodular cast irons.

Much metal coming directly from the blast furnace is of ideal composition for treatment with *mischmetall* for the production of nodular cast irons and this may provide a relatively cheap way of producing high-duty cast irons for casting near to the blast furnace. It should be noted here that cerium is uusally lost on re-melting and it is therefore not possible to treat a pig iron with the element and then to remelt it and obtain nodular structures.

Mischmetall will dissolve readily in all low phosphorus and low sulphur cast irons to give a satisfactory yield of cerium at temperatures in excess of 1300°C. The optimum temperature range appears to be 1350 to 1450°C. With metal temperatures of below 1300°C there may be a deposition of hypereutectic flake graphite in the liquid metal before the addition is made. Flake graphite already in existence before the addition is made is unaffected by the addition of cerium. This flake graphite may have a harmful effect on mechanical properties so that the metal temperature should always be in excess of about 1300°C for compositions lying between 3.5 and 4 per cent Tc and 2.3 and 3 per cent Si.

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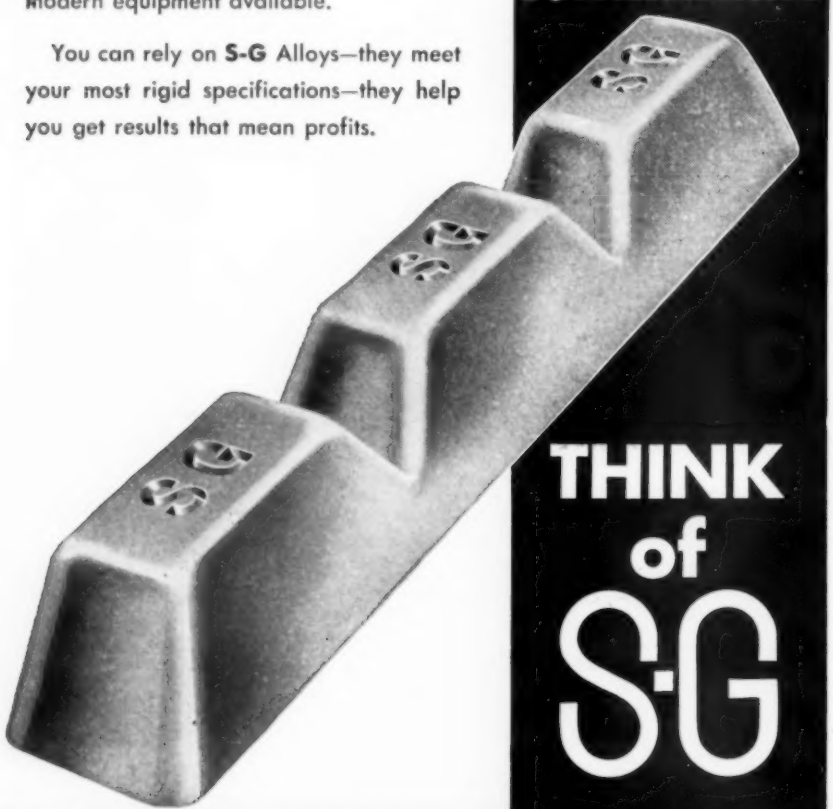

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Add Mischmetall First

It has been found that, for the purpose of the double treatment process, the cerium-containing addition must dissolve before the inoculant and obviously, therefore, the best way to ensure this is to add the *mischmetall* and, after it has dissolved, to add the inoculant. This method does, however, entail certain difficulties in routine production, but it has been found that, in the case of 80 per cent ferrosilicon and S.M.Z., the *mischmetall* and inoculant may be added simultaneously by putting the two together at the bottom of the ladle and running the metal on to them. Under these conditions the *mischmetall* probably dissolves more rapidly than the inoculant and so the correct order of solution is obtained. The results given in Table XXII illustrate the mechanical properties of a nodular iron prepared in this way, cast in a 1.2-in. bar. The inoculant in this case was S.M.Z. and the microstructure of the material was almost completely nodular with only a trace of the quasi-flake graphite.

For the best mechanical properties in nodular cast irons it is necessary that the phosphorus content should be as low as possible and preferably below 0.1 per cent. Phosphorus, besides having a directly harmful influence, reduces the solubility of cerium in the melt and with phosphorus contents in excess of about 0.5 per cent it is not possible to dissolve sufficient cerium in the melt to have the required effect. The results presented in Table XXIII illustrate this point.

A 300-lb crucible furnace melt of hematite pig iron was poured in four successive taps, an addition of ferrophosphorus was made to the metal remaining in the crucible after each tap, and each ladle of metal was treated with the same amount of mischmetall. The bars from Taps 1, 2 and 3 had hypereutectic nodules and

(*Continued on page* 244)

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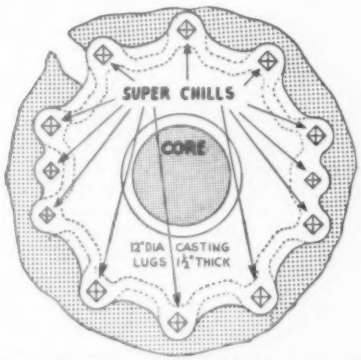
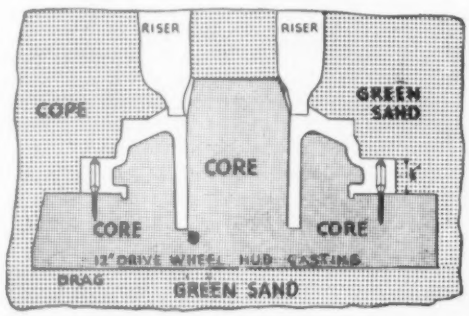
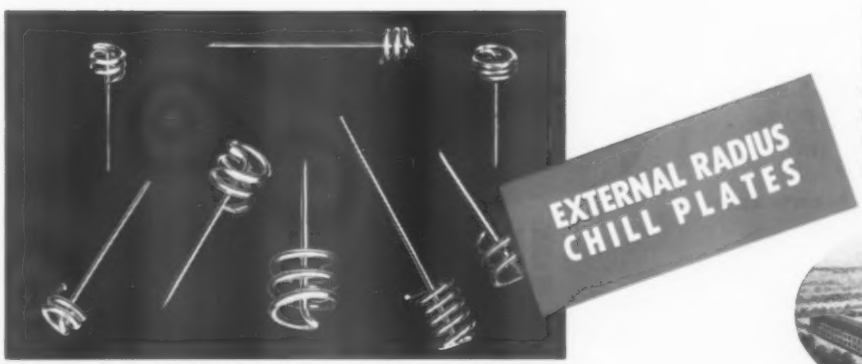


Plane Section (above) and Cross Section (below) of actual Drive Hub Casting showing location and use of Super chills.





FANNER CHILLS today are playing an increasingly important part in the production of good castings, due primarily to the fact that Fanner engineers have made an extensive study in many, many foundries, and have, as a result, designed and produced chills for practically any situation that might arise in the production of better castings. Consult Fanner engineers not only on shrinkage problems, for which there is a Fanner chill "cure"—but on all your casting problems. No obligation, of course.

Birdseye View of the Fanner Brookside Park Plant in Cleveland

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(*Continued from page* 242)

quasi-flake graphite, but the bars from Tap 4 had normal graphite structures. It will be seen that although the same addition of mischmetall was used in each case, the yield of cerium decreases with increasing phosphorus content until with 0.57 per cent P the amount of cerium is only 0.010 per cent, that is, below the minimum of 0.020 per cent required to give the nodular structure. Considering the mechanical properties of the first three taps, it will be seen that even though the treatment has been effective in modifying the graphite structure in each case, the influence of phosphorous in lowering the level of mechanical properties is marked.

This paper is not intended to serve as a guide to those intending to produce nodular cast irons—it being beyond the scope of any one paper to present all the necessary details—but some of the difficulties and possibilities in the commercial production of the material have been referred to.

Nodular cast irons represent a new material and with a material of this nature much work is required before a full appreciation of its possibilities can be realized. This must therefore be considered as a preliminary account, to be amplified and modified at a later date as more results and experience are obtained.

The development of nodular cast irons is the outcome of many years' research on the subject of graphite formation. The process itself is relatively complex and the metallurgical background out of which it has developed is somewhat unusual. Many of the concepts which have served so well for ordinary cast irons are no longer applicable to the new material.

The production of nodular graphite structures in the manner described depends upon a delicate series of chemical and physical reactions and hence the ultimate commercial development of the process will involve rigid technical control. The method described may be supplanted at a later date by newer and improved methods, but it is believed that their basic features will be similar to those already outlined. At least, it is felt, it can justly be claimed that nodular graphite structures are no longer the unique characteristic of conventional malleable cast irons produced by the heat-treatment of white cast iron. A new field in the metallurgy of cast iron has been opened which may eventually have tremendous possibilities.

Consider Mechanical Properties

While the production of nodular structures provides an interesting field for theoretical speculation, it is appropriate to consider the mechanical properties of this material with the new type of structure. Has it any useful mechanical properties? In this context it must be immediately pointed out that the material, while having some of the microstructural characteristics of malleable iron, does not possess the mechanical properties of conventional malleable iron. Nodular cast irons are still relatively non-ductile and brittle and they do not exhibit a yield point, although their shock resistance is very much superior to that of the best high-duty flake-graphite irons. There are obvious reasons for this difference between the nodular cast iron and malleable cast irons. Nodular cast irons have, compared with most malleable irons, relatively high carbon and high silicon contents, and in the as-cast state are subject to all the heterogeneity of any as-cast material. There is evidence that by appropriate heat treatment nodular

(*Continued on page* 246)

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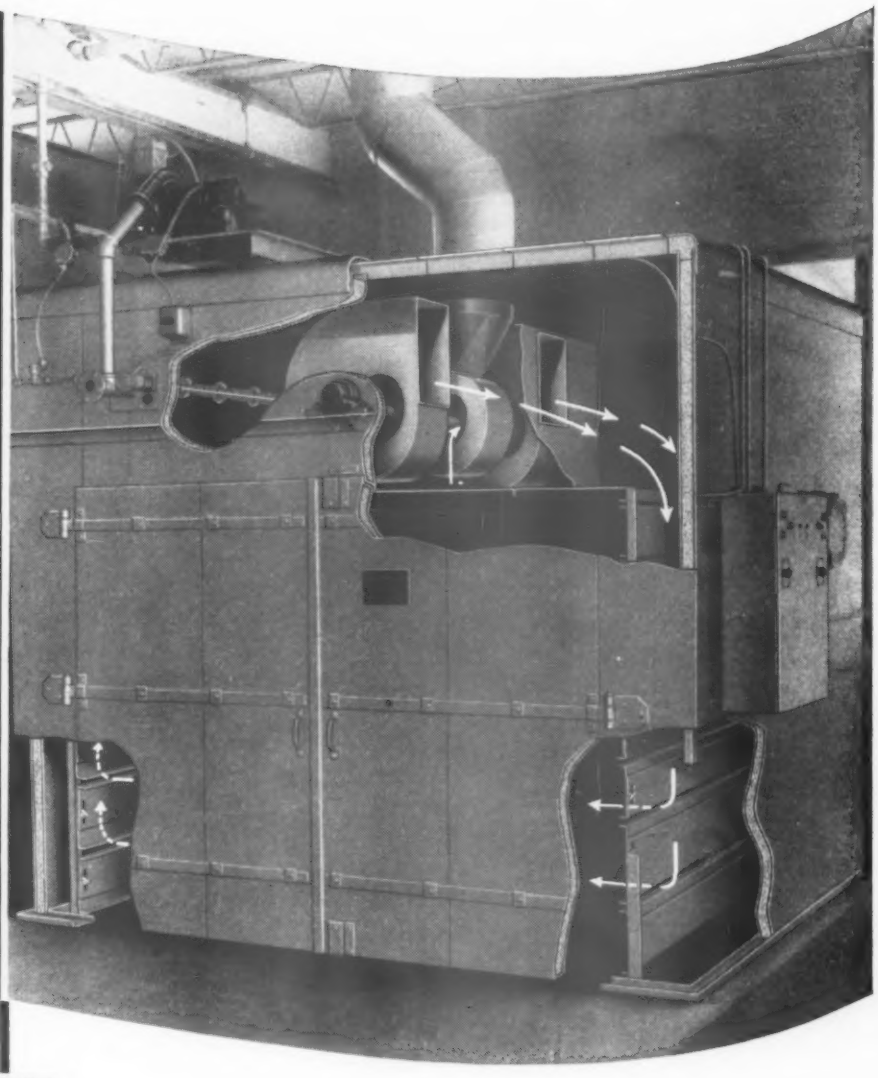

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(*Continued from page* 244)

cast irons may develop a measure of ductility, but this is still largely a matter for future work.

Compared with flake-graphite irons, nodular cast irons can be produced having transverse rupture stresses and tensile strengths as good as, and better than, those of accepted high-duty cast irons. In addition, these high values may be obtained at a relatively low level of hardness and with shock-resistance figures as high as two to four times those of high-duty gray cast irons.

The damping capacity of nodular cast irons is appreciably lower than that of any flake-graphite cast iron. Insufficient work has been carried out upon the fatigue properties of nodular cast irons to permit a conclusive comment, but the indications are that endurance ratios of approximately 0.5 may be expected. In addition, the evidence available suggests that nodular cast irons are more notch-sensitive than gray irons in a dynamic test, but less sensitive in a static test. Stress/strain curves for nodular cast irons are essentially of the same type as those for flake-graphite irons, but nodular cast irons are characterized by relatively lower plastic strain at low and relatively high plastic strain at high loads. It will be seen that nodular irons possess mechanical properties which might render the material particularly suitable in the field of engineering applications where high strength and shock resistance are required, together with good machinability. By appropriate heat treatment or by the use of special alloying elements the mechanical properties of nodular cast irons can be raised to a very high level.

Some Commercial Difficulties

Commercial production of nodular cast irons has to contend with two main difficulties: first, the high carbon contents, and second, the low sulphur contents required. For many years in the production of high strength cast iron, the emphasis has been upon the utilization of controlled low carbon contents and therefore the demand for high carbon contents requires a fresh approach to the problems of melting and raw materials in the iron foundry. There is nothing intrinsically or metallurgically difficult in production of high carbon contents and it is possible that the future will see important developments in this connection. Low sulphur contents are, perhaps, more difficult to achieve, largely because of the necessity, in most British foundries, of using the cupola furnace. It is not essential to desulphurize cupola-melted metal, but unless this be done, a considerable waste of cerium alloy will occur. If basic-lined ladles be used, the soda-ash process for desulphurization is efficient, but most foundries will prefer to avoid a process involving the treatment of the metal in the ladle with several successive additions. At the moment there is no easy way around this difficulty and soda-ash desulphurization will have to be applied with cupola melting. Again, however, the problem of desulphurization in the iron foundry is still a field of considerable possibilities. For instance, it is possible that the use of the basic-lined cupola may provide a satisfactory solution to the whole problem.

It will be gathered from the foregoing remarks that much further work requires to be carried out on the production of nodular cast irons. The stage has been reached, however, when the work must be carried out on a large scale under industrial conditions. The process, as it has been described, is now no longer a matter

(*Concluded on page* 248)

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Casting output was severely hampered in a large mid-Western foundry due to the limited capacity of the core room – in-and-out time was too slow. In this case, reduced baking time was the only logical answer and it called for a change in core mixes.

A Swan-Finch engineer analyzed the problem... recommended specific mixtures of Safco Core Oil and Tykor Compound for tractor manifold, machine tool base and carburetor cores.

In all cases, baking time was substantially reduced – on some cores as much as 50% (one 2-hour cycle instead of two at 500°F.). Cores ranged in size from ¼ lb. to 300 lb. Overbake was not critical. Cores had hard surfaces and sharp edges... shakeout was improved. Sand worked smoothly in boxes and blowers... drew clean. And what's more, the S-F binders averaged 11% more economical than the product formerly used.

When your core room becomes a "waiting room," call a Swan-Finch engineer. His recommendations can mean faster in-and-out... higher production... new economy... new efficiency in your overall operation through improvements in your core room.

SWAN-FINCH OIL CORPORATION
RCA BLDG., WEST • NEW YORK 20, N. Y.

ANNOUNCING

A RESEARCH AND ADVISORY SERVICE ON PROBLEMS RELATING TO

DESIGN OF BLOWER CORE BOXES

*We invite you to send your core blowing problems to us . . . if our years of experience don't provide the answer, we'd like to study the problem and find the answer!

FOR INSTANCE

Through research and experience, we have found that core box maintenance has been reduced as much as 300% through the proper design and the application of our *Seal-Tite Ribbing*.

The Abrasive Resistance of Various Metals has had our careful study so that we can tell exactly what to expect when a core box is put into production. The accompanying table shows the relative resistance to abrasion of fifteen materials which have been tried in core box construction.

BLAST RESISTANCE TEST RESULTS

Material No.	Efficiency
1	145%
2	135%
3	100%
4	76%
5	70%
6	63%
7	50%
8	50%
9	44%
10	42%
11	41%
12	35%
13	32%
14	20%
15	10%

If you aren't getting the core box life you think you should or if you are planning new core box equipment, we invite you to ask for our Advisory Service. We will welcome the opportunity to give you the benefit of the specialized experience and research which we have devoted to these problems.

New BULLETIN on Core Blowing

We invite you to send for a copy of our new 8-page BULLETIN F
"CORE BOX DESIGNING AND RIGGING FOR CORE BLOWING"

Harry J. Jacobson and Ed. W. Swiess.

INDUSTRIAL PATTERN WORKS

PATTERNS FOR PRODUCTION—PATTERN ENGINEERING SERVICE

2600 BELMONT AVE., PHONE: IRVing—0413 CHICAGO 18, ILL.

(*Concluded from page* 246)

for the laboratory and extensive field tests are being conducted on an increasing scale. If nodular cast irons possess a commercial future, the rate at which they are adopted will depend to a large extent upon the ability of the industry successfully to deal with the new problems involved.

The authors desire to thank the Council and Director of the British Cast Iron Research Association for permission to publish the work recorded in this paper. They are also indebted to several of their colleagues on the staff of the association who have assisted in various aspects of the work described. In this connection they wish to record their indebtedness to W. J. Williams, to W. Westwood and A. Mayer for providing suitable analytical techniques, and to D. Marles of the association's metallography laboratory.

REFERENCES

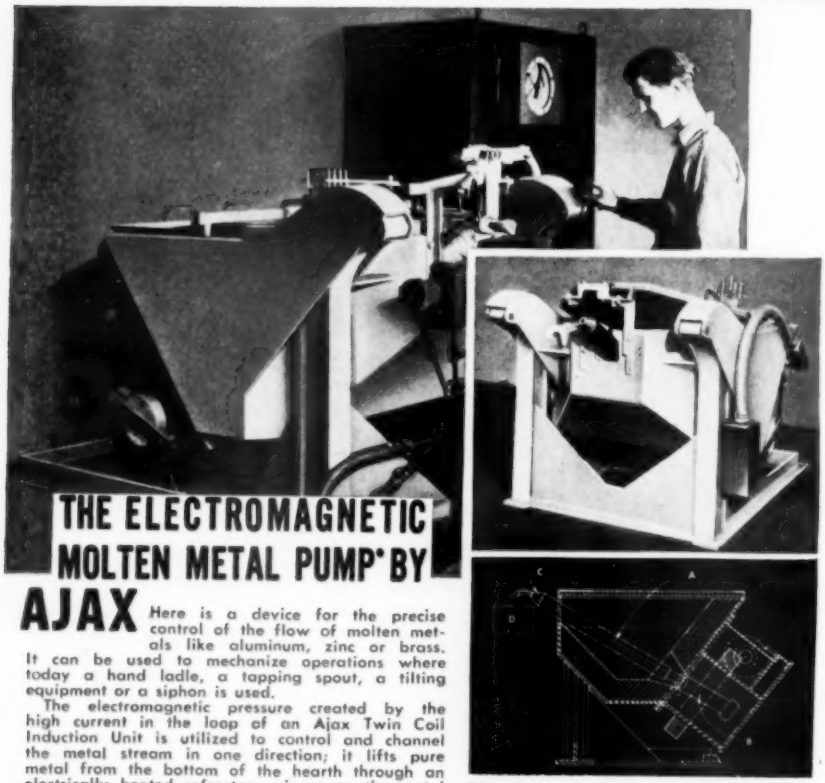
1. Morrogh, H., and Williams, W. J., *Journal* of the Iron and Steel Institute, 1947, March, pp. 321-371.

2. Morrogh, H., and Williams, W. J., Paper No. 875, 44th Annual Meeting, 1947, Institute of British Foundrymen.

3. Morrogh, H., and Williams, W. J., *Journal* of the Iron and Steel Institute, 1948, March.

4. Morrogh, H., *American Foundryman*, 1948, April.

A *New* NON MECHANICAL METHOD FOR CONTROLLED PUMPING OF MOLTEN METAL



THE ELECTROMAGNETIC MOLTEN METAL PUMP BY AJAX

Here is a device for the precise control of the flow of molten metals like aluminum, zinc or brass. It can be used to mechanize operations where today a hand ladle, a tapping spout, a tilting equipment or a siphon is used.

The electromagnetic pressure created by the high current in the loop of an Ajax Twin Coil Induction Unit is utilized to control and channel the metal stream in one direction; it lifts pure metal from the bottom of the hearth through an electrically heated refractory pipe over the metal level to its destination. The electric current alone controls the flow.

Castings ranging from ¼ lb. to 30 lbs. or more can be poured in endless repetition with good accuracy in weight. Special problems requiring a continuous flow of hundreds of pounds per minute can be handled by the same unit. The electromagnetic pump is also a molten metal reservoir maintaining metal temperature accurately.

The large photo shows the Ajax-Tama Electromagnetic Pump at work. Control cubicle in rear maintains temperature, energizes pump from electric timer, electric eye, or similar devices. Second photo is a close-up of the pumping unit. Below is a cross section of unit showing discharge pipe (A), induction channel where pressure is created (B), pouring spout (C), and mold (D).

Ask AJAX for more information. Patents applied for and allowed.

AJAX ENGINEERING CORPORATION
Trenton 7, N. J.

AJAX TAMA-WYATT INDUCTION MELTING FURNACE

Associate Companies: AJAX METAL COMPANY, Non Ferrous Ingot Metals and Alloys for Foundry Use
AJAX ELECTROTHERMIC CORP., Ajax Northrup High Frequency Induction Furnaces
AJAX ELECTRIC CO., INC., The Ajax-Hultgren Electric Salt Bath Furnace
AJAX ELECTRIC FURNACE CORP., Ajax-Wyatt Induction Furnaces for Melting

International Picks Holland for 1949

The International Committee of Foundry Technical Association held its annual meeting during the International Foundry Conference at Prague, Czechoslovakia, the week of Sept. 12. Various modifications in the by-laws were made at that time. It was decided that the next International Congress will be held in Holland in 1949.

President for 1949 is Rene Deprez, president of the Belgium Technical Foundry Association, and the vice president is to be nominated by the Czech Association. Tom Makemson, secretary of the Institute of British Foundrymen, was unanimously re-elected honorary secretary. Foundry section of the Italian Institute of Mechanical Engineers, which is an organized technical group of Italian foundrymen, had applied for membership in the International Committee and was duly elected.

Aluminum Industry Anniversary

At the autumn meeting of the Aluminum Association, held Oct. 14 in Pittsburgh, founders of the aluminum industry observed its 60th anniversary. Held under the auspices of the Historical Society of Western Pennsylvania, ceremonies high-lighted the early days of the industry. A feature of the event was the re-enactment of the first pouring of aluminum ingot produced commercially in 1888, by the electrolytic process. Meeting also included the regular fall sessions of the association's board of directors and of its foundry, extrusion, and sheet divisions.

ASEE Board Meeting

University of Detroit was host to the executive board of the American Society for Engineering Education at its autumn meeting held at the Engineering Society, Detroit, Sept. 20. The executive board of the society has final authority with reference to budget, publications, meetings and conventions, appointment of officers and eligibility of institutional members. Dean Clement J. Freund, University of Detroit, is society president.

MELTING STAINLESS STEEL IN AN INDUCTION FURNACE

(*Concluded from page 97*)

play safe and keep the columbium content near the maximum, and 1.95 per cent Cb was aimed at. Ferrocolumbium (50-60 per cent) was used which figured to be 3.33 lb per 100 lb steel. Since some of the columbium was lost due to oxidation the average heat finished with an analysis of 1.60 per cent Cb. When the bath reached the pouring temperature as determined by an optical pyrometer, the metal was tapped into hand ladles and poured into the molds.

As time went on, it was noticed that the ingot heats were running a consistent analysis. So it was determined to try making the metal by a shorter method. This was done by predetermining the average analysis of a 10,000-lb batch of type 321 by melting and analyzing 200 lb chosen as representative of the 10,000-lb batch. This analysis of the scrap was taken as typical of the analysis of the whole pile of type 321. The scrap was charged with iron ore and melted with the additions added in the same order as they were added when analyzed ingots were used for making the heats. Of course, a new set of figures had to be evolved for this type of melting.

The same iron ore (0.23-lb), ferromanganese (0.48-lb), aluminum (0.13-lb), and ferrocolumbium (3.33 lb) were used. The ferrosilicon was upped to 0.84-lb to increase the metal fluidity. The nickel addition was lowered so that the desired content was 12.00 per cent because of the wider spread possible in a 10,000-lb pile of scrap.

Since the metal was not melted twice, a lower value had to be used for the chromium addition. The formula used for the ingots gave an analysis very close to the top of the specification, 20.00 per cent, so that 0.5-lb less chromium was added for a 10,000-lb batch. This gave heats that were satisfactory in chemical analysis.

Since quite a bit of each casting was scrap in the form of sprues and risers, the question was raised as to why these parts could not be remelted. So a 10,000-lb batch of 60 per cent type 347 returns and 40 per cent type 321 cuttings was gathered together, and 200 lb considered representative of the bath was melted and analyzed. The analysis showed that a large savings in alloys would be made using this type of scrap for the charge. So this type of charge was adopted for making the steel.

In the average heat, only 0.50 per cent Ni was used where previously it had been necessary to add 2.00 to 2.50 lb. The ferrochromium addition was cut from an average of 4.50 lb to 2.00 lb. The ferrocolumbium addition was cut from 3.33 lb to 1.13 lb.

Columbium in the scrap will not be lost completely as will titanium when the metal is melted. The average heat of 60 per cent type 347 return scrap and 40 per cent type 321 cuttings had a residual Cb of 0.85 per cent noted in later calculation.

The metal made with the returned type 347 scrap and 321 cuttings gave the same quality castings as that made from analyzed ingots. The evolution of this company's method of melting has been given to show how constant surveillance and a watchful eye on economies will lead to changes in melting practice. Also this article might help some other company or melter who is faced with the problem of making stainless steel in the induction furnace with no prior experience in this general direction.

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MANGANESE BRONZE

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long time favorite with mfrs. of marine fittings.....

leaves sand clean and bright-takes a mirror-like finish.....

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AJAX ENGINEERING CO

NEW Equipment AND Supplies

1

(1)—Sand Blast Helmet:

E. D. Bullard Co., 275 Eighth St., San Francisco—New sand blast helmet has an outer hood of Neoprene rubber covered Fiberglas with vulcanized seams and molded rubber lens frame. Self-adjusting knitted elastic neckpiece is attached to the inner cape, and the cape is attached to the helmet by a slide fastener, permitting its easy removal for cleaning with ordinary soap and water or any antiseptic. The full floating hammock and sweatband also are designed for quick removal for cleaning or replacement. Air is brought into the helmet across the facepiece to prevent lens fogging, and also to keep a direct airstream off the wearer's head. Standard equipment includes a laminated lens and a clear cover glass, held in place with a retainer that needs no tools to remove or replace, and a screen facepiece cover for shot blasting. Complete helmet assembly includes belt, break-valve, and connecting hose. Helmet weighs approximately 5 lb.

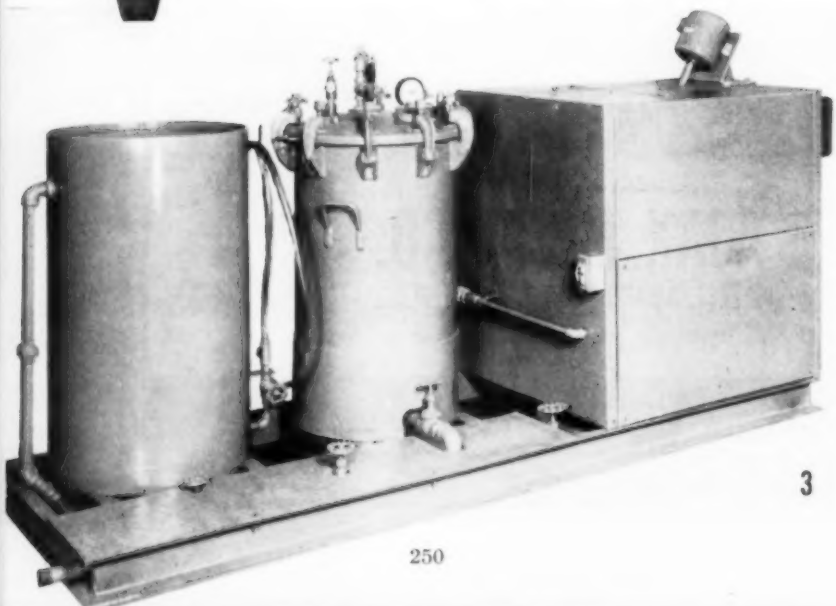
(2)—Abrasive Tools:

Rotor Tool Co., 17325 Euclid Ave., Cleveland—New line of 360-cycle portable abrasive tools includes small wheel grinders, cone sanders, 4, 6 and 8-in. straight grinders, 6-in. cup grinders, 7 and 9-in. sanders and 9-in. polishers. The 6-in. straight grinder is shown here. The tools are equipped with squirrel cage induction motors in which the speed of the motor is governed by the frequency of the power supply which is 360 cycle current (220 v, 3 phase) supplied by an inductor frequency converter or motor generator. Motor spindle speed is 21,600 rpm and is used direct for small wheel work, mounted points or rotary files. For 4, 6 and 8 in. grinding wheels or for sanding, buffing or polishing the motor speed is geared down to the correct spindle speed. There are no electrical connections between the stator and the rotor in 360 cycle tools and the load speed under severe load holds to within 5 per cent of the free speed.

(3)—Casting Impregnator:

Metallizing Co. of America, 3520 West Carroll Ave., Chicago—Combination vacuum and pressure unit uses a special metallic impregnating solution for eliminating porosity in pressure castings. Machine consists of a vacuum pump, sealing tank, supply tank and agitator, heating elements, high-

2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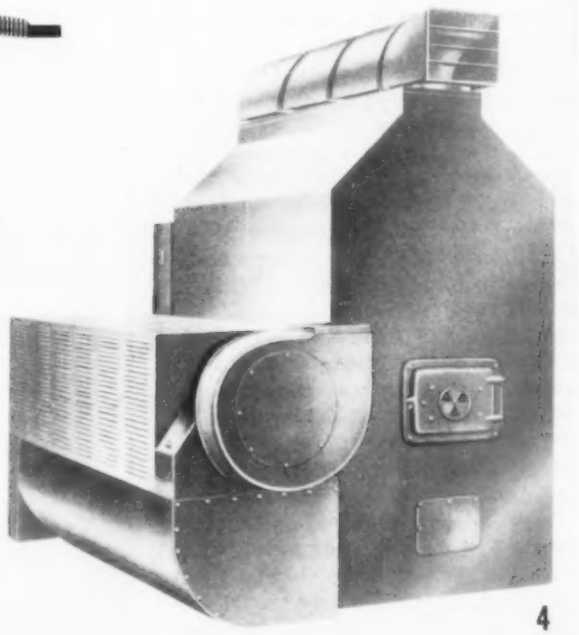
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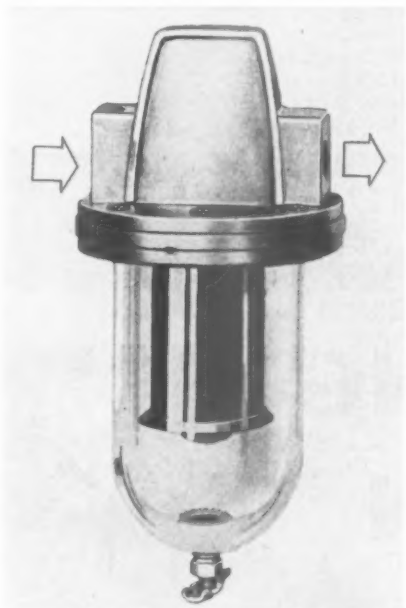
pressure air connector, rinsing tank, and city water supply and drain connections. In operation, equal amounts of water and impregnating solution are placed in the supply tank and heated to 190° F. Castings are placed in the pressure tank and a vacuum is drawn and held. The vacuum line is shut off, air pressure of 90 psi is put in the tank and held for 15 minutes, and the castings then are removed and placed in a rinse tank where sealing solution adhering to the surface is removed.

(4)—Space Heater: Dravo Corp., Fifth and Liberty Aves., Pittsburgh 22—New warm air space heater is designed for easy fuel convertibility between coal, gas or oil. Developed primarily as a coal-fired unit the new model is available in two output capacities, 1,250,000 Btu per hour and 1,500,000 Btu per hour. When the unit is operating, air is drawn into the base, passed over economizer tubes and combustion chamber and discharged through overhead nozzles. Heater can be used with or without ducts, and can be adapted to bring in and heat outside air. It is usable for summer ventilating and is adaptable for process drying and curing. Standard equipment includes a hopper model bituminous coal stoker. Anthracite or bin-feed stokers also can be supplied. Automatic operation of the fans and stoker is controlled by room temperature thermostats.

Soap Dispenser: Central Products Co., 214 West Ohio St., Chicago 10—A single moving part in a new dispenser for granulated, bead

or powdered soap measures uniform quantity, dispenses it and returns to loading position as pressure on operating lever is released. Designed primarily for industrial, office and public washroom use, the dispenser is filled through a perforated diaphragm which prevents pilfering even though device has no lock or catches, it is claimed. Excessive humidity is said not to cause caking or clogging. To prevent "bridging" dispenser contents are thoroughly agitated, each time it is used, by a spiral wire agitator attached to the operating plunger.

Air Filter: Hannifin Corp., 1101 South Kilbourn Ave., Chicago 24—Micronic type air filter is designed to remove moisture, emulsified oil, grit, scale and other impurities from compressed air supplied to air-operated equipment. Air enters the bowl through spiral baffles which cause it to swirl in a circular path throwing off impurities toward the



wall of the bowl. Impurities that do not drop to the bottom are then removed at the outer edges of the filter cartridge by a method known as edge filtration as the air passes between the layers of the cartridge. Cartridge is cleaned by closing the air supply line and permitting entrained compressed air to blow back with the drain petcock open.

Temperature Tester: General Electric Co., Meter and Instrument Divisions, Schenectady 5, N. Y.—Portable oven-temperature tester for checking the performance and efficiency of heating appliances is a sensitive direct current millivoltmeter calibrated for use with iron copnic (constantan) thermocouples having a resistance of 2.0 ohms. It is said to give quick, accurate readings when checking new installation performance or the efficiency of ovens, control processing or heating equipment, automatic irons and other appliances. It consists of a 3½-in. panel instrument mounted in a small case with a compartment for storing the thermocouple assembly and leads.

With a scale range from zero to 650° F, the instrument has an accuracy of plus or minus 5 per cent of full scale value, it is claimed.

Core Binder: Interlake Chemical Corp., Union Commerce Bldg., Cleveland 14—Liquid synthetic resin core binder, known as Ibon, is said to offer a number of advantages when used with sand free of clay and bentonite and when 4 per cent or better moisture is used in the core mixes. Some of the advantages claimed are that cores of maximum baked strength and hardness are obtained at minimum binder concentration, cores have sharp edges with good detail and resistance to shock and abrasion, baking cycles can be reduced, oven temperatures can be lowered and gassing during baking, casting and shakeout is reduced. Binder is available in 55-gal steel drums or 8000 and 10,000-gal tank cars.

Fork Truck: Baker Industrial Truck Division of Baker-Raulang Co., 2168 West 25th St., Cleveland—Center control fork truck is designed to handle loads up to 2000 lb, 36 in. long. It has a 42-in. wheelbase, 30-in. width and overall length exclusive of forks of 63 in. It requires 76½ in. plus the length of the load to make a right angle turn. Truck weight is 3850 lb. A travel controller providing three speeds forward and reverse is interlocked with a foot switch in such a manner that the truck may be started only with the controller in first speed. Standard

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save money by reducing replacement time due to the fact that they retain their correct orifice longer than cast iron nozzles . . . They do not need steel casings and are remarkably light and easy to handle . . . Due to the above reasons you can save money on every sand blasting operation if you use PYRAMID CERAMIC NOZZLES and in addition they are attractively priced and ready for delivery. A trial order will convince you . . . Write today.

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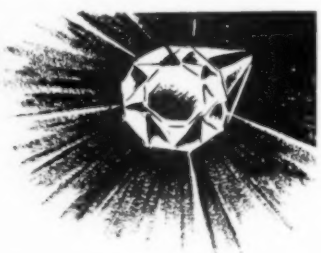

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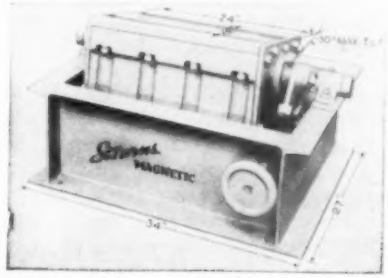
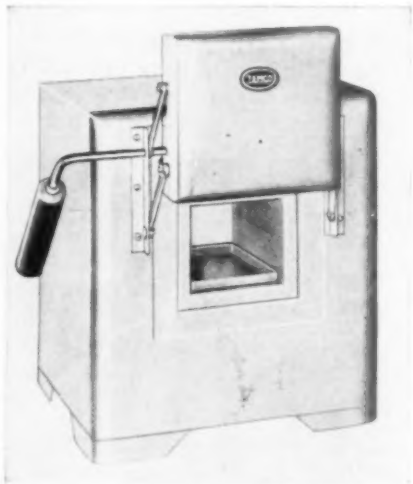
battery equipment is rated at 36 v and 250 amp-hr which is said to be sufficient for 10 to 11 hours service under average operating conditions.

Holding Magnet Frame: Stearns Magnetic Mfg. Co., 662 South 28th St., Milwaukee 4—Tilting frame intended as auxiliary equipment for grinder holding magnets is designed to grip castings and other



material and save time in preparing jigs and clamping devices. Frames permit positioning work in a 30 degree arc and are designed to accommodate grinder holding magnets of 16 x 14, 16 x 24 and 16 x 40 in. Frames may be furnished for different size magnets already in operation.

Electric Furnaces: Thermo Electric Mfg. Co., 480 West Locust St., Dubuque, Iowa—New line of bench-type electric furnaces designed for laboratory uses and heat treating carbon and high chrome steel

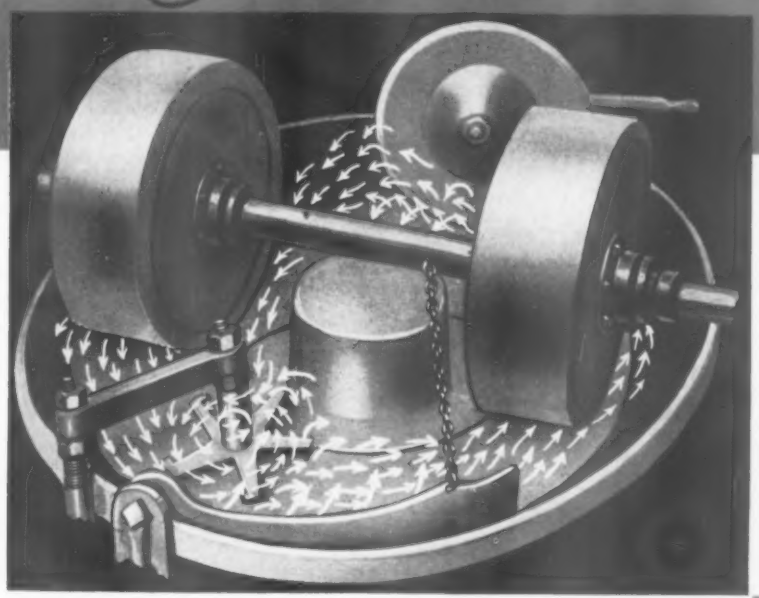


parts and tools comes in six sizes ranging in chamber dimensions from 3½ in. high, 4 in. wide and 4½ in. deep to 7½ in. high, 8½ in. wide and 18 in. deep. Furnaces are said to be fast heating and may be operated up to 1650° F for continuous use and to 1900° F for short periods. Nickel-chromium heating elements are embedded in refractory plates which form the sides, top and bottom

(*Continued on page 254*)

THE *Clearfield* MIXER

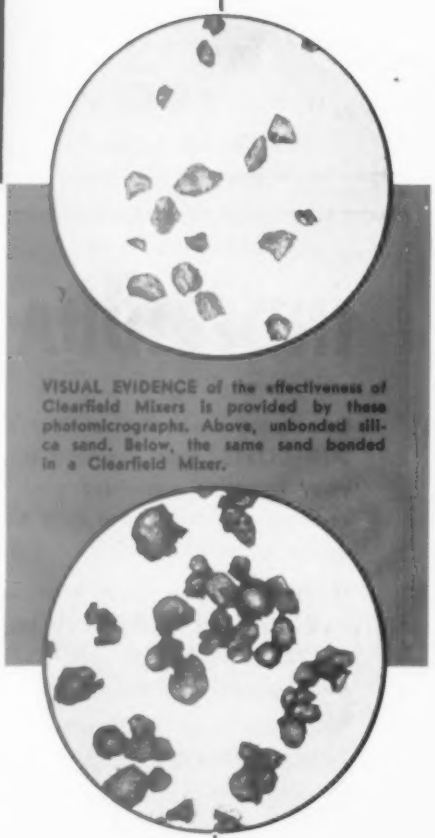
prepares better foundry sand



Foundry sand is composed of three principal elements, silica grains, bond and moisture. The quality of this sand depends in major part upon how well these three elements are blended. Therein lies the explanation of the outstanding performances of Clearfield Mixers.

Clearfield Mixers employ the revolving pan principle of sand preparation. The mullers are mounted on a floating shaft and revolve by contact with the moving sand. Centrifugal force together with the stirring action of the agitator and disc transform the sand from an inert mass into a fluid moving stream. The result is a perfect blend of the three elements—and foundry sand that does its job perfectly.

There's a Clearfield Mixer which will meet all your sand preparation needs. Write today for Catalog No. 79 for complete details.



VISUAL EVIDENCE of the effectiveness of Clearfield Mixers is provided by these photomicrographs. Above, unbonded silica sand. Below, the same sand bonded in a Clearfield Mixer.

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MIXES, TEMPERS, AERATES

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(*Continued from page* 252)

of the heating chamber. The two smaller size furnaces have an indicating pyrometer, pilot light, toggle switch and stepless input controller permitting current regulation between 5 and 100 per cent time "on" with temperature from 350° F to maximum. The four larger furnaces may be operated by a separate stepless input controller or by a controlling pyrometer. Four sizes operate on 115 or 230 v, 50/60 c. The two larger sizes are for 230 v only.

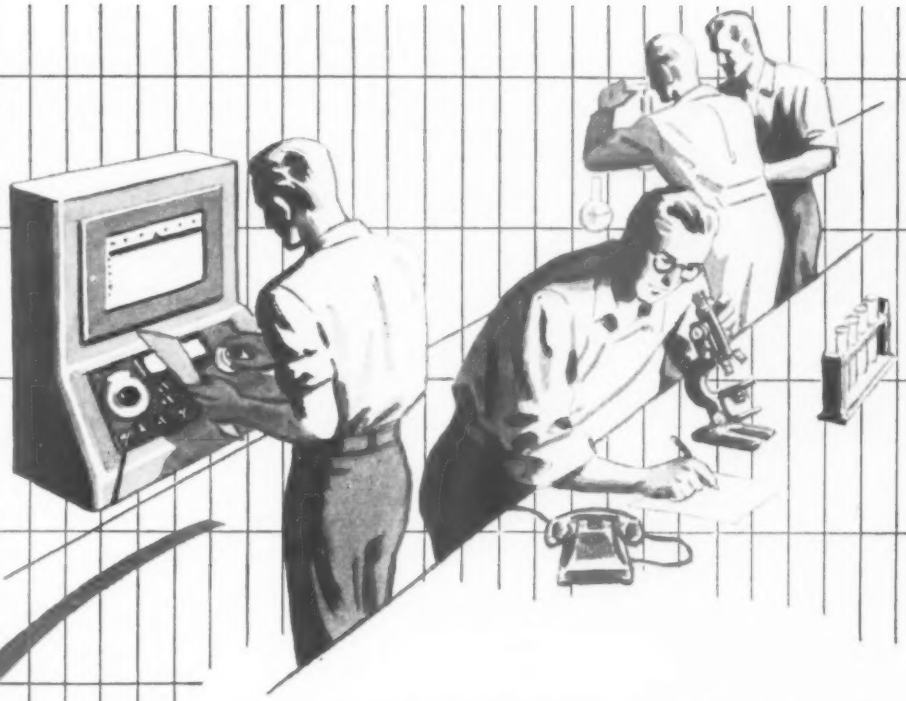
Power Shovels: Frank G. Hough Co., 703 Sunnyside Ave., Libertyville, Ill.—Chief improvement in

the company's 10½ cu ft and 1¼ cu yd power shovels is the addition of a hydraulic bucket control as standard equipment. Control dumps and closes the bucket by hydraulic power and permits dumping the bucket gradually or abruptly by fingertip control and closing immediately by the same control. Bucket need not be grounded and dragged to close it; trucks or other vehicles are relieved of load-dumping shock, wear and tear; portions of the bucket load can be deposited in two or more places.

Motorgears: Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5—New line of motor gears is available with the company's axial air gap "pancake" motor, converting

it into a gear motor. Available in ratings from ¾ to 10 hp, these gear units are symmetrical in design with no separate right-hand or left-hand

(*Continued on page* 256)



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VACUUM Principle eliminates all pressure on the oil, insures utmost safety. *NON-CLOGGING Design* regulates flow of oil indirectly with an atmospheric air valve. No valves or chokes in the air line—the torch holds its oil adjustment and operates steadily without attention. *MANY USES.* Ideal for skin drying of molds, core patching and other jobs. No oil drips into the molds. No. 301—½ gal. tank, 2" nozzle. No. 301A—1 gal. tank, 2½" nozzle. Write for Bulletin F-809.

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ENGINEERS & MANUFACTURERS OF INDUSTRIAL HEATING EQUIPMENT

(*Continued from page* 254)

assemblies. The motor may be removed from the gear housing and run separately. Gear unit employs two ratios of single helical gears with gear shafts mounted on tapered roller bearings. The motorgear is suitable for horizontal mounting, preferably on a level floor, but provision can be made for wall, ceiling or angle mounting, provided the shafts remain horizontal.

Combination Grinders: Standard Electrical Tool Co., 2507 River Rd., Cincinnati 4—Combination grinder-disk grinder is available in various sizes. Maximum size grinding wheel is 24 x 3 x 1½ in., powered by a 10-hp motor. Smallest size is 10 in. with a 1-hp motor. Machines also handle plate-mounted disk grinding wheels from 10 to 24 in. diam. Bearing wear is taken up by an external adjustment; it is not necessary to dismantle the spindle assembly.

Microscopes: Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y.—New series of wide-field microscopes consist of 15 basic models that can be interchanged into 58 different combinations for various purposes. One instrument offered for use in surface examination permits inspection of a circular area 5 feet in diam. The microscopes' optical systems are completely sealed to prevent dust from reaching the interior. New objectives are designed to minimize image deterioration at the edge of the field of view, while new eyepieces provide a higher eye point for greater comfort and prevent interference with glasses, should the microscopist wear them. Dust-proof, sliding nosepiece on three-objective models is said to offer a rapid, convenient means of interchanging objectives and insures viewing the subject with

(*Continued on page* 258)

VELSICOL

America's FOREMOST CORE OIL!

Foundry Performance is PROOF of VELSICOL Superiority

Your own tests will prove that VELSICOL light-colored core oils offer greater economy—are geared to greater castings production in your foundry. They represent the greatest dollar value available in core oil because only VELSICOL manufactures and controls, under rigid laboratory specifications, the hydrocarbon resins that assure uniform quality to these light color oils. Many foundries have switched to VELSICOL, for this core oil develops the highest strength to gas evolution ratio of any core, and consequently gives a smooth and clean casting finish. So for unexcelled workability, change to VELSICOL—America's foremost core oil!

"VELSICOL"

VELSICOL CORPORATION

General Offices: 330 East Grand Avenue, Chicago 11, Illinois
Branch Offices: New York • Detroit • Cleveland

Manufacturers of: **Insect Toxicants • Aromatic Solvents • Core Oils**

Representatives:

F. F. PEARLES CO.
Detroit, Mich.

W. A. ZEIS
St. Louis, Mo.

FOUNDRY SUPPLY CO., INC.
St. Paul 4, Minn.

H. S. STOLLER & CO.
Akron, Ohio

MANUFACTURER'S EQUIPMENT & SUPPLY CO.
Chattanooga 2, Tenn.

WILSON INDUSTRIES
Cambridge 42, Mass.

THE TRABON CO.
Chicago, Ill.

GENERAL FOUNDRY SERVICE CORP.
Oakland, California

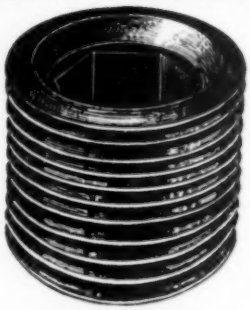
INSURE A SEAL BETWEEN CORE BOX AND BLOW PLATE

with the PETERSON

HOLINER

Trade Mark Registered

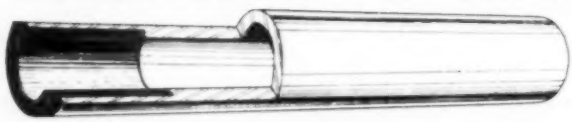
Here's a patented rubber bushing that offers the foundryman a host of advantages. The HOLINER bushing insures a seal between core box and blow plate on core machines. The HOLINER also ends blow plate abrasion without costly machining, makes plywood blowplates last like steel, makes it possible to blow through narrow ribs and small bosses, permits the salvaging of old plates and core boxes eroded beyond normal use and makes possible adjustment to meet an uneven or wedge shape core box.



HOLINER BUSHING
Pat. No. 2,423,341

See The HOLINER Bushings and Tubes At Your Foundry Supply Dealer Or Write For Complete Details

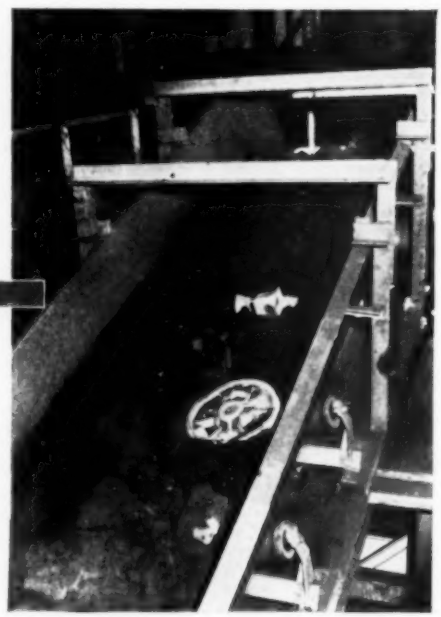
THE HOLINER TUBE



The HOLINER tube is used in core boxes mounted on blowing machines having the draw feature. Blow tube sand column will not draw out of HOLINER tube. Cope side of core is ready for drier without patching, brushing or blowing off.

MARTIN ENGINEERING COMPANY
KEWANEE, ILLINOIS

$750 per hour shutdown stopped by Sahara Belt



Over six months ago a leading manufacturer of farm implements installed a Super-Insulated Sahara Belt to convey **red hot** castings and sand ejected from knockout. Plant officials figured this belt would more than pay for itself if it lasted only 30 days but eliminated conveyor shutdowns which cost $750 per hour. This belt has now been in service over 6 months without a single plant shutdown chargeable to the belt conveyor.

Unexcelled for Hot Materials

Made of 37½ ounce tight woven duck combined with asbestos and special insulating material and then impregnated. Insulated Sahara handles materials from 300° F. to 450° F.; Super-Insulated Sahara, from 450° F. to 600° F.

Write for Data Sheet 47-8 and prices.

IMPERIAL BELTING CO.
1755 S. KILBOURN AVE., CHICAGO 23, ILL.

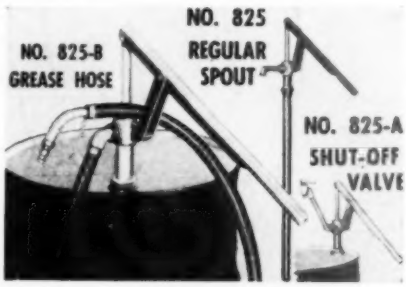
Imperial
INNER-LOCKED
BELTING

Engineered Belting—
The Right Belt for Each Job

(*Continued from page* 256)

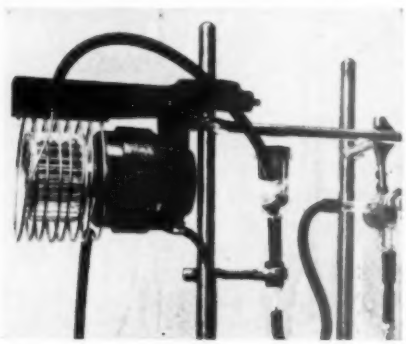
but one objective at a time. New illuminator and fluorescent lamp permit arrangement of lighting to suit the subject. Black and white diffusing disks provide background contrast.

Drum Pump: General Scientific Equipment Co., 2700 West Huntingdon St., Philadelphia 32—Pump is said to handle any fluid which seeks



its own level except lacquer thinners. It is claimed that heavy greases are pumped at rates up to 3 gpm with pumping rates higher for alcohol and other light fluids. Smooth flow is maintained as air pressure, created by pump action, eliminates splashing and waste. Pump screws into a 1½-in. or 2-in. drum bunghole on 15, 30 and 60 gal drums. It is available in three models: with regular spout for general use (825), with shut-off valve to reduce losses by evaporation (825A) or equipped with 8-ft grease hose (825B).

Gas Cooler: Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4—Gas cooler for a volumetric carbon determinator, used in conjunction with a laboratory combustion furnace for determining the



total carbon percentage in metal, cools the incoming gas from the combustion furnace to room temperature at which the carbon determinator operates. Incoming gas passes through small diameter stainless steel tubing placed in a field of air current from a blower fan connected to an electric motor. With this arrangement, the incoming gases are

(*Continued on page* 260)

CITIES SERVICE

DELCO ...core oils
...core & mold washes
ROSINAL...liquid core binder

They've served foundrymen for many years, son, and we've never gone wrong with CITIES SERVICE core oils and mold washes. You know, the high quality of their product never varies.

Cities Service Oil Co.

CHICAGO—CLEVELAND—KANSAS CITY—ST. PAUL

PERFECTION

may exist only in heaven . . . but ASBURY FACINGS will help you toward it here on earth.

For 53 years this company has produced

GRAPHITE FOUNDRY FACINGS, CORE AND MOLD WASHES, PIPE ELIMINATOR AND CARBON RAISING GRAPHITE. *These products have been accepted by foundrymen all over the WORLD, yet we keep on trying to improve them. We have again expanded our facilities and if we don't attain perfection we aim to come close to it.*

THE *Asbury* GRAPHITE MILLS INC.
ASBURY, N. J.

Extra yard profits from low cost handling with

ROUSTABOUT CRANES

. . The fast tractor-footed load-hustlers

● You've got a crane with hook or magnet anywhere you want it around your foundry exactly when you want it—when a Roustabout is on the job. Single line "hook-on" type bucket for coal, sand and coke, magnet for castings. Fast powerful, this mobile load-hustler gives you low cost materials handling indoors and outdoors—keeps things organized, on the move, prevents costly delays—no waiting for crews from other jobs. Built for years of overwork—ball-bearing boom turntable, all gears in oil. Capacities to 7½ tons—it's the answer to your materials-handling problem. For complete facts . . . write to **Dept. K-6.**

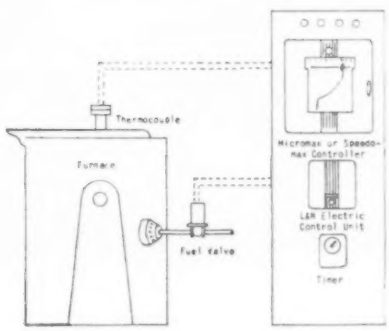
Photo courtesy of Industrial Power Division, International Harvester Company

HUGHES-KEENAN CORPORATION
DELAWARE, OHIO, U. S. A.
Load-Handling Specialists since 1904

(*Continued from page* 258)

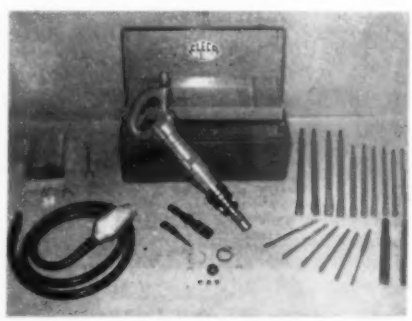
brought to the same temperature at which the volume measuring parts of the carbon determinator operate, and greater accuracy in carbon determination is said to be made possible.

Furnace Control: Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44—Electric control is designed to bring batch furnaces for



melting aluminum to temperature quickly and accurately without danger of overshooting. To avoid overshooting, the controller automatically turns off the fuel supply at a predetermined point so that the charge comes smoothly to pouring temperature. If necessary, it also holds the charge accurately at pouring temperature as long as desired. The controller turns the fuel from full on to full off, regulating the durations of on-time, thus supplying the heat input needed to balance the heat demand of the furnace. It also operates a set of lights which indicate when fluxing and pouring temperatures are reached.

Rock Drill: Cleco Division, Reed Roller Bit Co., Box 2119, Houston 1, Tex.—Nine-pound rotary rock drill that hits and rotates simultaneously is available in a kit box containing,



in addition to the drill, the following items: No. O line oiler, 6 ft of hose with fittings, one pint oil, metal carrying case, padlock, instruction sheet, ½-in. open end wrench, two each of the following size star drills; ½ x 9 in., ⅝ x 9 in., ¾ x 9 in., ¼ x 5 in.,

(*Continued on page* 262)

FREEMAN *Dowmetal* PATTERN PLATES

All Plates Shipped Same Day Order is Received

TRY THEM FOR COPE AND DRAG MOUNTINGS

Many foundries are already using FREEMAN PATTERN PLATES as they are LIGHTER, STRONGER and IMMEDIATELY AVAILABLE in ANY SIZE AND QUANTITY. Surfaces are held to CLOSE PARALLEL TOLERANCES and plates are of UNIFORM THICKNESS.

With their clean VELVET FINISH, plates are received in proper condition for mounting patterns. Drilling, tapping and NECESSARY MACHINING to mount patterns is DONE MORE EASILY on free-cutting DOWMETAL PATTERN PLATES.

For regular pattern or cope and drag work, we can furnish ANY PRACTICAL SIZE 5/16"—3/8"—1/2"—5/8"—3/4"—1" THICKNESS. When ordered by flask size, we allow 1" for flask and 2-1/2" on each end for pins and ears. If square or rectangular plates are desired, specify overall size and thickness. For special shapes send a template or sketch. LITERATURE AND PRICE LIST AVAILABLE.

THE FREEMAN SUPPLY CO.

Pattern Shop and Foundry Supplies and Equipment
Mahogany and Pine Pattern Lumber
1152 E. BROADWAY TOLEDO 5, OHIO

Proved and Approved . . .

NEW CESCO Cup-Type Goggles

FEATURING...

The COMFORT-KING Headband —holds goggles firmly with 30% *less tension.* Made of round molded rubber—it will not kink, curl or twist. No sharp edges. Instantly adjustable.

Job-Tested and Worker-Endorsed Where Constant Use Is Required

CESCO's new development in cup-type goggles increases wearer comfort and assures greater worker safety. These goggles have a lightweight feel, yet give sturdy protection. Individually contoured cups fit both left and right eye areas snugly and comfortably, without pressure. COMFORT-KING Headbands provide gentle, firm fit. Use of CESCO goggles will prove their advantages *to you.*

SEVERAL MODELS AVAILABLE

CESCO Chippers Goggles—No. 545-C with brown thermoplastic cups shown at top of column. No. 545-T with transparent cups shown below.

CESCO Welders Goggles—No. 545-W with 50 mm Cescoweld and cover lenses shown below.

***Write for CATALOG**—New CESCO Catalog tells where to use, how to select protective equipment. Be sure to have this informative book.*

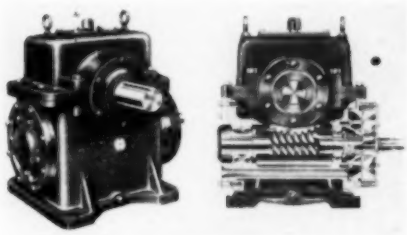
CHICAGO EYE SHIELD COMPANY
2336 Warren Boulevard • Chicago 12, Illinois
OFFICES IN: Boston, Buffalo, Cincinnati, Cleveland, Columbus, Detroit, East Orange, Houston, Los Angeles, Philadelphia, Pittsburgh, Seattle, St. Louis, St. Paul, Toledo, Tulsa, Montreal

CESCO FOR SAFETY

(*Continued from page* 260)

5/16 x 5 in., ⅜ x 5 in., 1 in. and ⅞ in. There also are two chisels—one cold 9 in. and one cut ⅞ x ⅛ in. Spare drill parts include three pawls, pawl spring, lock spring, ratchet wheel and tool holder. Drill can be used to drill holes in all kinds of masonry, concrete and stone and is convertible to a chipping hammer with the removal of only one part.

Worm Gear Drives: Foote Bros. Gear & Machine Corp., 4545 South Western Blvd., Chicago 9—New line of enclosed worm gear



drives is available in horizontal and vertical types in a wide range of standard ratios. Features claimed include increased load carrying capacity, increased thermal capacity, reduced oil leakage, reduction in size and weight and improved mechanical capacity.

Stacking Box: Palmer-Shile Co., 16033 Fullerton Ave., Detroit—Stacking box for handling miscellaneous parts is of all-steel welded construction. It has a four-way en-

trance with a corrugated bottom and is supported by four angle legs with shoes for floor protection. Square box construction permits stacking any way. They are built in any size to customer requirements.

Carbide Mills: Severance Tool Industries Inc., 753 Iowa St., Saginaw, Mich.—Three new carbide midget mills, each the largest of its respective shape, have been added to the company's line. These mills operate best at speeds of 2000 to 5000 sfm and are said to cut hard mate-

(*Concluded on page* 264)

USE SCIENTIFIC Pressure Cast MATCH PLATES

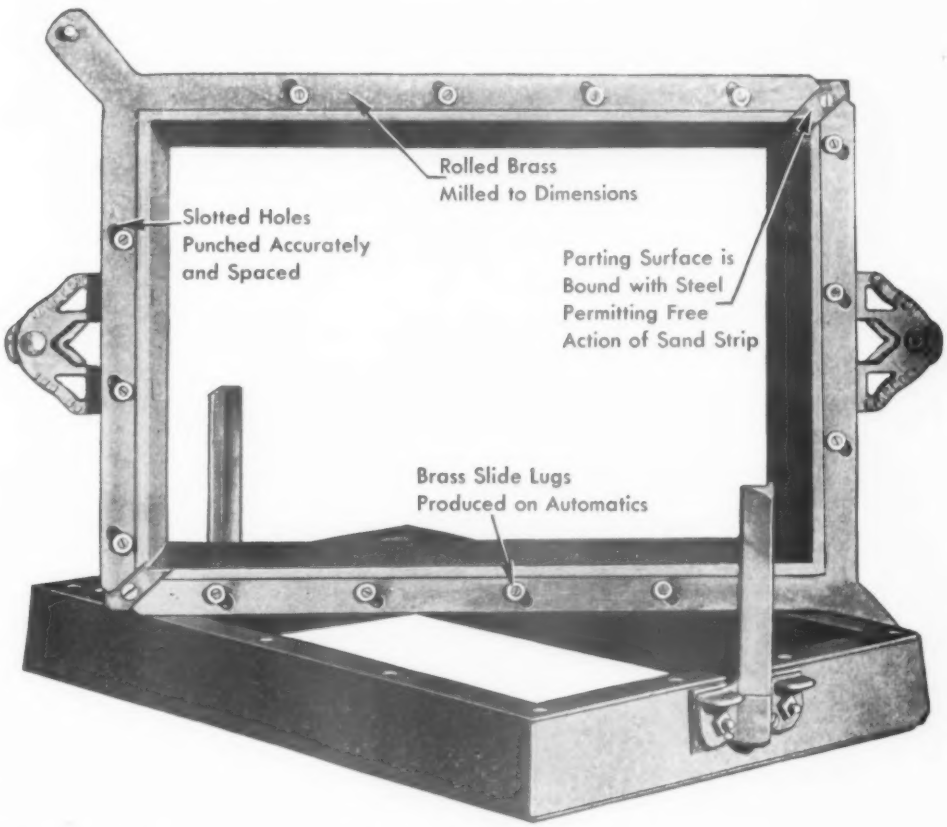
SHARP PARTINGS • ACCURATE PATTERN DUPLICATION • LOWER COSTS

The SCIENTIFIC CAST PRODUCTS Corp.

1388-1392 EAST 40th STREET
CLEVELAND 3, OHIO
2520 WEST LAKE STREET
CHICAGO 12, ILLINOIS

Now » » a BIG improvement in foundry flasks!

DIAMOND introduces Precision-made, 100% machined sand strips.



PROMPT DELIVERY

** Increased production facilities, ample supplies of materials permit us to give prompt delivery.*

Write for

BULLETIN "F"

for complete details on this outstanding new line of fine foundry flasks.

DIAMOND

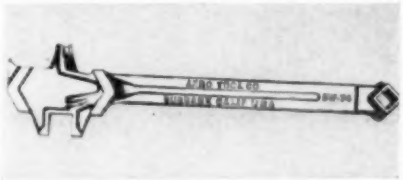
Telephone 2553 CLAMP AND FLASK COMPANY Richmond, Indiana

Designers of **CORE PLATES, JACKETS, BANDS, FLASKS** *since 1889*

(*Concluded from page* 262)

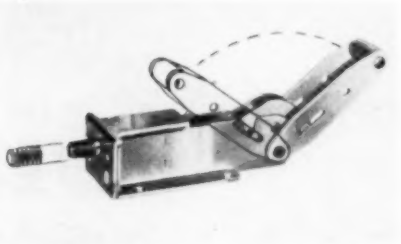
rials up to 63-C Rockwell. They can be used in freehand operations where the tool is applied to the work manually, or they can be chucked in machines and the work manipulated either manually or mechanically. When dull, they can be reground many times, it is claimed.

Drum Wrench: Aero Tool Co., 6930 Avalon Blvd., Los Angeles 3—Cadmium-plated cast steel universal wrench has sockets and lugs so



placed to fit all standard steel drum closures. Wrench will fit male, female and hexagon drive closures and closures driven by internal lugs. It also has a steel lip for removing steel caps over drum closures. Wrench is 15½ in. long and weighs 2½ lb.

Clamp: Lapeer Mfg. Co., 2906 West Grand Blvd., Detroit — Push, pull clamp is intended to perform in places where space is limited or under circumstances where the operating handle cannot be accommodated except at some distance from the point of pressure application. It can exert up to 800 lb pressure with normal hand operation in either the push or the pull movement of the handle, which will automatically lock and hold work securely upon completion



of the handle swing. Plunger is supplied with both an external ⅜-24 thread and an internal ¼-28 thread.

Work Bench: Tri-State Metal Products Inc., Box 1513, Pittsburgh 30—Heavy duty work bench is made with 11 gage prime steel top, 13 gage prime steel channel legs and is reinforced with cross members. It is 32 in. high, 28 in. wide, 72 in. long and weighs 150 lb. Benches are shipped in individual cartons with the necessary nuts and bolts included for quick assembly.

ALUMINUM EY-BARS

are widely accepted by steel mills and steel foundries for the production of better steel and better steel castings

MADE ONLY BY

THE CLEVELAND ELECTRO METALS CO.

2391 W. 38th ST. CLEVELAND 13, OHIO

★

Member of Aluminum Research Institute

RADIANT Since 1879 FACINGS

BILL GAGGER *says:*

They're New!! They're Better!!

RADIANT LIKWIPART

For all metal pattern production work. More and cleaner lifts per application. Fast drying. Leaves a polished finish on the pattern. A little goes a long way.

RED BALL • LIQUID PARTING

An oily base type liquid parting. Fine for sand slinger and plaster molding work. Stays in perfect solution.

DUXBAK

As waterproof as a duck's back, yet swabs easily. Clean lifts and meets all insurance and state industrial requirements.

. . .

Samples of any, or all of these will convince you.

The Smith Facing & Supply Co.

1857 Carter Rd., Cleveland, Ohio

350 Feet of Conveyorized Core Ovens DoDgE a Maze of 55 Posts 10′ Centers

ENGINEERS Draw on 46 Years of Experience to Lick Another Tough Problem

Flexibility of DESPATCH equipment—plus 46 years of accumulated oven experience—made the planning and installation of these two conveyorized ovens "just another job" for DESPATCH engineers. These two gas-fired ovens modernized the corebaking facilities of a large Midwest manufacturer of farm tractors.

Not one square foot of floor space was wasted. Heaters, fans and motors were sandwiched in between posts 8′ apart in the 6′ space from oven top to ceiling. The sketch above indicates how the ovens themselves fill all the available floor space. Result: *maximum capacity for continuous baking of large and small cores.*

Whether you need a standard batch or drawer type oven or a large, conveyorized, high-production unit, DESPATCH can help you plan and install an oven to fit your requirements.

Batch Type Mold Oven

Batch Type Finish Baking Oven

Pot Type Tempering Furnace

DESPATCH Engineers Ovens for *All* Industrial Heating, Drying, Baking

FOUNDRY OVENS: Many standard oil or gas-fired batch or drawer type units available, special units built to fit your needs. Fast, uniform convection heat . . . no baking rejects.

BAKING-DRYING OVENS: Fast, efficient, low cost ovens for frit, plastics, coil and armatures, etc. Any size from small lab ovens, thru tray or rack models, to large conveyor installations.

COMPLETE FINISHING SYSTEMS: Ovens, Conveyors, Bonderizers, Spray Booths, Air Conditioners and Dryers.

INDUSTRIAL FURNACES: All types and sizes for temperatures up to 1250° F., including 100% mechanized units; gas, oil or electric. For ferrous or non-ferrous work: heat treating, stress relief, aging, bluing, tempering, drawing and metal tests.

Write today for Bulletin J-31. See Despatch Bulletin in 1949 Sweet's File for Mechanical Industries.

621 S. E. 8th Street, Minneapolis 14, Minnesota
221 N. LaSalle Street, Chicago, Illinois

DESPATCH OVEN COMPANY

Plastic PATTERNS NOW

Our specially developed techniques and practices now make plastic patterns practical and a reality for production use. Numerous foundries, who have been using these low-cost pattern plates for some time, find them definitely superior. Our plastics are adaptable for duplication of single shrink patterns, duplication of broken aluminum patterns, master patterns, cope and drag sections and core boxes.

Let us make a "PLASTIPLATE" pattern for you. A trial will convince you of the advantages. Write for Bulletin "F" or phone for complete information.

LOOK FOR THE NAME

"PLASTIPLATE"

TO IDENTIFY PLASTIC PATTERNS OF OUR DESIGN

REPRESENTATIVES IN FOLLOWING CITIES:

MICHIGAN MANUFACTURERS SERVICE, INC.
414 Book Building
Detroit, 26, Michigan

MISSOURI PATTERN WORKS, INC.
4143 Laclede Avenue
St. Louis, 8, Missouri

ATLAS PLASTIC & ALUMINUM PRESSURE PLATE CO.
4813 North 124th Street
Butler, Wisconsin

PLASTIC CORPORATION OF CHICAGO

2444 South Central Ave., Cicero 50, Ill.
Phone: LAwndale 1-2661

...TRADE PUBLICATIONS...

OIL STANDBY EQUIPMENT: Surface Combustion Corp., 2375 Dorr St., P. O. Box 907, Toledo 1, O. —Bulletin SC-139 describes oil standby equipment for use with gas furnaces during periods of gas curtailment. Information is presented on the controls and additional equipment required. Fuel oil specifications for the burners are included.

WELDING BOOKS: Air Reduction Sales Co., Dept. A19-24P, 60 East 42nd St., New York 17—Folder provides details of five welding and cutting instruction books available from the company. Two volumes are devoted to arc welding, two to oxyacetylene welding and cutting, and the fifth is a "Manual of Design for Arc Welded Steel Structures."

CARBIDE MILLS: Severance Tool Industries Inc., 753 Iowa Ave., Saginaw, Mich. — Bulletin 16-W features carbide micro-mills, both the straight shank and the taper mount series. It also lists carbide midget mills and provides information on cutting speeds, uses, applications, cautions, materials, regrinding possibilities, and other features.

ROOF TILE: American Structural Products Co., Ohio Bldg., Toledo 1, O.—Booklet describes the physical properties and construction specifications of a new insulating roof tile which is said to be easy to install and to combine fire resistance, structural strength and insulation in a single roof deck material.

PORTABLE ELEVATOR: American Hoist & Derrick Co., 63 South Robert St., St. Paul 1—Catalog 200-D-6A deals with a portable material elevator with an allowable height of 97 ft and a platform lift of 90 ft. Catalog contains operating views and a description of mechanical details.

MICROCASTINGS: Austenal Laboratories Inc., 715 East 69th Pl., Chicago 37—Illustrated booklet contains examples of parts produced by the precision investment casting technique and lists parts suitable for quantity production by this process as well as the range and type of alloy which may be used.

METALS FOR INDUSTRY: Continental-United Industries Co., 345 Madison Ave., New York—Booklet gives a history of the company and describes the various products manufactured in different units of the company.

GRINDING WHEELS: United States Rubber Co., Grinding Wheel Dept., Fort Wayne 4, Ind.—Catalog and price list covers company's high-speed resin-bonded and rubber-bonded grinding wheels.

DRILL PRESS: South Bend Lathe Works, 299 East Madison St., South Bend 22, Ind.—Catalog 400 covers the company's new 14-in. precision drill press available in bench and floor models. Motors, controls, extra spindles, and other drill press accessories are illustrated and described. Complete specifications and prices are listed. Diagrams are used to show all important dimensions of the presses.

AIR FILTERS: Dollinger Corp., 11 Centre Park, Rochester 3, N. Y.—Bulletin SIF describes a line of dry-type intake air filters for all types of air compressors, diesel and gas engines, blowers, motors and generators. The various filters described in the bulletin include silencer models, regular dry-type and breather filters ranging in size from 6 to 8000 cfm in single units.

DRIVE CHAINS: Jeffrey Mfg. Co., 907 North Fourth St., Columbus 16, O.—Catalog 808 describes the company's steel thimble roller drive chains. Tables of specifications and ratings are included. Photographs show close-up views of the various models of chains and illustrate chain manufacturing operations in the factory.

BRONZE PRODUCTS AND ALLOYS: Ampco Metal Inc., 1745 South 38th St., Milwaukee 4—Bulletin 95 gives information on a wide range of bronze products and alloys including rod and sheet, nonsparking safety tools, resistance and arc welding electrodes, corrosion resistant centrifugal pumps, plug valves and fabricated assemblies.

AIR COMPRESSORS: Ingersoll-Rand, 11 Broadway, New York 4—Form 145 describes in detail the company's newest portable air compressor. A number of air tools also are described, and various industrial applications of compressed air are illustrated.

BATTERY CHARGERS: Electric Products Co., 1725 Clarkstone Rd., Cleveland 12—Bulletin 222 illustrates and describes company's multiple-circuit, automatic battery chargers equipped with two-bearing motor generators for nominal ratings up to 25 kw.

CONVEYORS: Ajax Flexible Coupling Co., English St., Westfield, N. Y.—Bulletin 35 describes various models of vibratory conveyors for bulk materials. Construction features are discussed and typical applications are illustrated.

SAND MIXERS: National Engineering Co., 549 West Washington Blvd., Chicago 6—Illustrated folder describes the company's sand mixers and lists specifications and capacities of each.

RETAINING RINGS: Waldes Kohinoor Inc., 47-16 Austel Pl., Long Island City 1, N. Y.—Catalog 4K-6 (pt. 2) provides specifications and data for all standard types of retaining rings. Data include ring di-

STANDARD HORSE NAIL CORPORATION
CHILL KOOLHEAD NAILS
COLD FINISHED HOT FORGED

76 YEARS *supplying chill nails to the foundry industry*

Koolhead Spider Chills

Chill Nails

Steel

Stainless

Brass

Aluminum

HORSE SHOE NAILS
for chilling purposes

Catalog on request

STANDARD HORSE NAIL CORPORATION
New Brighton
Pennsylvania

mensions, housing and shaft dimensions, groove dimensions, thrust load capacities, materials, tensile strengths and types of finishes. Charts supply engineering and ring specifications for standard ball bearing assemblies.

OIL SLUDGE REMOVER: E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia 33 — Pamphlet describes a new product as a speedy, effective industrial fuel oil additive that removes sludge from fuel oil systems. Folder includes directions on how to use the product, how it works, and where best to use it.

LIFT TRUCKS: Hyster Co., 2902 N. E. Clackamas St., Portland 12, Oreg.—Folder illustrates three models of lift trucks from 2000 to 7500 lb capacity and a mobile crane of 10,000 lb capacity. Folder lists 59 foundry materials that can be moved with the company trucks and names 84 foundry uses.

GAS HEATERS: Automatic Gas Equipment Co., 301 Brushton Ave., Pittsburgh 21—Folder describes and illustrates gas unit heaters featuring cast iron heat exchangers. Specifications for six sizes, with output ranging from 172,000 to 68,000 AGA Btu per hour, are included.

ENAMEL: Brooklyn Varnish Mfg. Co., 50 Jay St., Brooklyn 1, N. Y.—Color card shows the ten standard colors, including black and white, in which the company's industrial enamel is available. The quick drying product is said to be applicable on wood or metal.

PHOTOMICROGRAPHIC EQUIPMENT: Bausch & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y. —Catalog E-210 deals with equipment for microscopy and photomicrography at high or low powers with transparent or opaque specimens. Prices are included.

MOTORS: Allis-Chalmers Mfg. Co., 1126 South 70th St., Milwaukee 1—Bulletin 05B6132A deals with large induction motors of the squirrel cage wound rotor, bracket bearing and pedestal bearing types. Charts furnish pertinent data on characteristics.

CASTING HOLDER: Dings Magnetic Separator Co., 4740 West McGeogh Ave., Milwaukee 14—Single sheet bulletin B-1802A illustrates and describes the company's electromagnet for holding castings during swing grinding operations.

ELECTRIC MOTORS: Lima Electric Motor Co., Dept. DN, Lima, O.—Bulletin MB-1 describes electric motors, multispeed gearshift drives, pedestal grinders and polishing and buffing lathes.

DESIGN DATA: Mechanite Metal Corp., Pershing Square Bldg., New Rochelle, N. Y.—New bulletin 27 entitled "Design Data Formulas and Charts for Computing Maximum Stresses in Angles, Ribbed Plates, and Shear Resistant Webs Containing Cut Outs," was compiled from ex-

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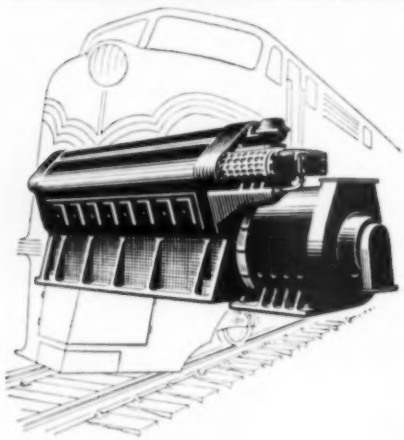

dieselization

Diesel engines in railroad locomotives are piling up an enviable trouble-free performance record. Many castings in these engines contain specified Molybdenum contents.

When wear or heat must be resisted, and high strengths are required, the use of Molybdenum in cast iron is becoming more and more routine.

The listing of a cylinder liner for Diesel use in railroad locomotives containing 3.20% Carbon, 1.90% Silicon, 0.85% Manganese, with 0.20% Chromium, 0.40% Molybdenum and 0.45% Nickel added can be found on page 10 of our new booklet—"Applications of Molybdenum Cast Irons."

Dozens of other alloy cast iron compositions used in Diesel engines, as well as hundreds of other Molybdenum-containing compositions are similarly listed in this new booklet. Write for it!

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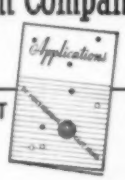

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tensive design research and contains 19 pages of formulas and charts on the subject. It is accompanied by a supplement which provides typical examples of applications of the data with specific references to the bulletin contents.

SOLDER: Alpha Metals Inc., 363 Hudson Ave., Brooklyn 1, N. Y.—Catalog 201 contains a solder selection guide which lists the 16 metals most frequently soldered in order of their solderability with recommendations for the best flux core solder or solder and flux suitable to soldering operations. Other tables list the physical characteristics of the company's various solders.

ALLOY STEEL: International Nickel Co., 67 Wall St., New York 5—Booklet describes the use of nickel alloy steel castings in various industries illustrating and describing representative castings. Depth hardening, weldability, and advantages of the alloy are discussed. Composition and specification tables are included.

SALT BATH FURNACE: Ajax Electric Co., Frankford Ave. at Delaware Ave., Philadelphia 23—Bulletin 122 describes a new submerged electrode furnace designed for the salt bath heat treatment of work of unusual length in the temperature range of 300 to 2400° F.

RESPIRATORS: American Optical Co., Southbridge, Mass.—Chart suggests the proper respiratory protection against more than 150 specific dusts, vapors and gases. Hazards are listed alphabetically with the recommended protection clearly identifiable.

PAINT: Vita-Var Corp., 1180 Raymond Blvd., Newark 2, N. J.—Folder outlines the advantages of using the company's white enamel for interior painting. The enamel is said to resist moisture, gases and ordinary fumes and to be non-yellowing and non-dulling.

FLAX: Archer-Daniels - Midland Co., 600 Roanoke Bldg., Minneapolis—The story of flax and its many uses in the production of varied products, including core oil, is told in an illustrated booklet printed on flax paper.

ELECTRODES: Wilson Welder & Metals Co., 60 East 42nd St., New York 17—Catalog contains an electrode selector chart, and general description, application, welding procedure, machanical property and specification data are included.

FLOOR REPAIR: Stonhard Co., 500 Stonhard Bldg., 1306 Spring Garden St., Philadelphia 23—Booklet tells how to make floor repairs simply and without delaying production schedules or traffic.

PULLEYS: Continental Gin Co., Industrial Division, FY, 4600 Tenth Ave., Birmingham 2—Catalog contains prices and data on transmission and conveyor pulleys of cast iron, steel and wing type.

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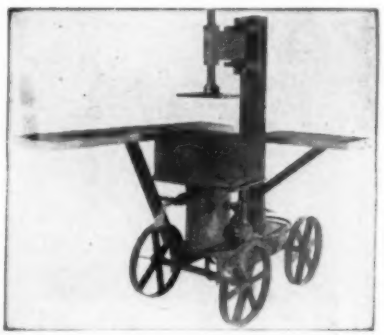

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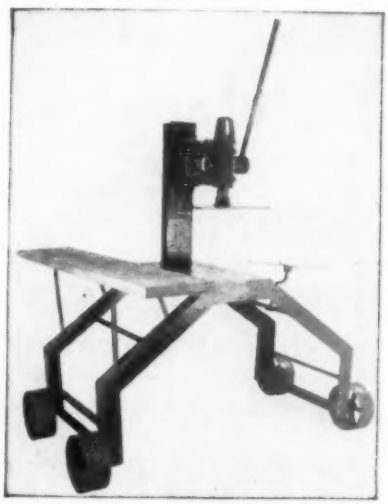

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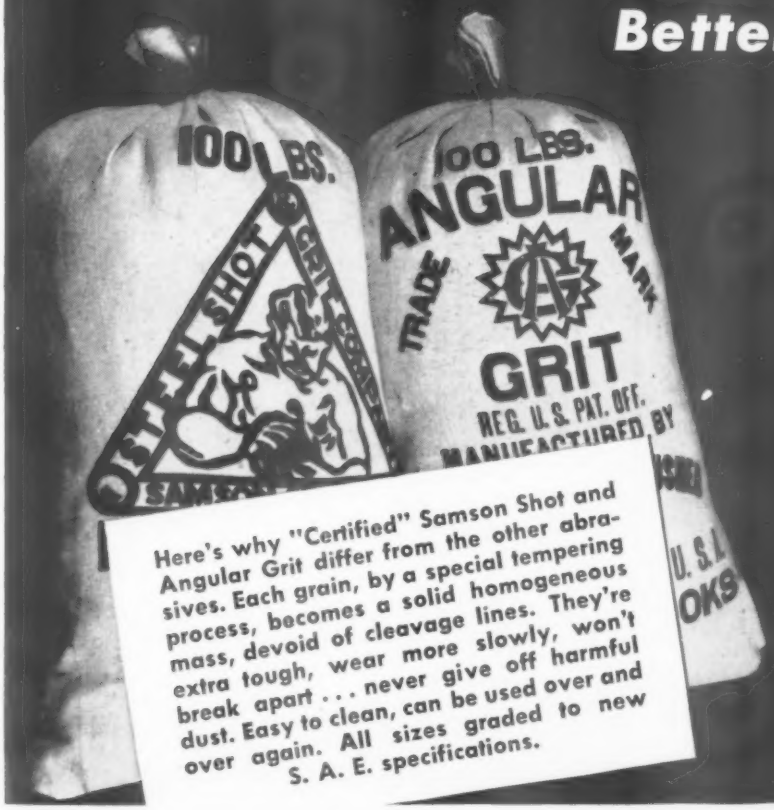

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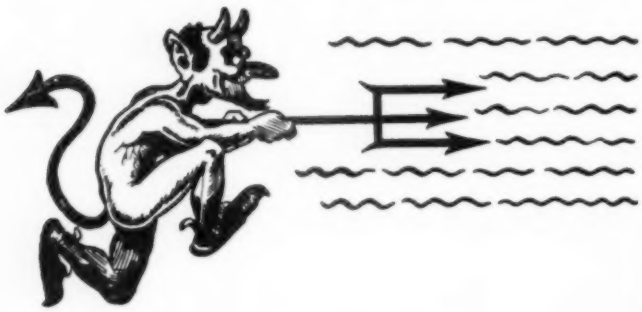

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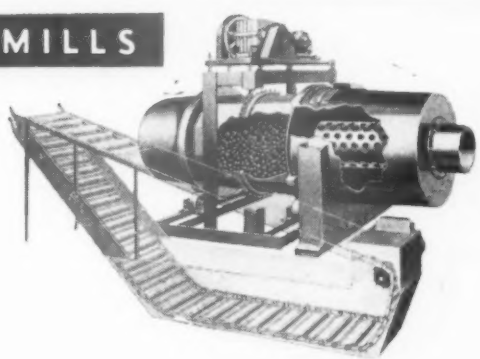

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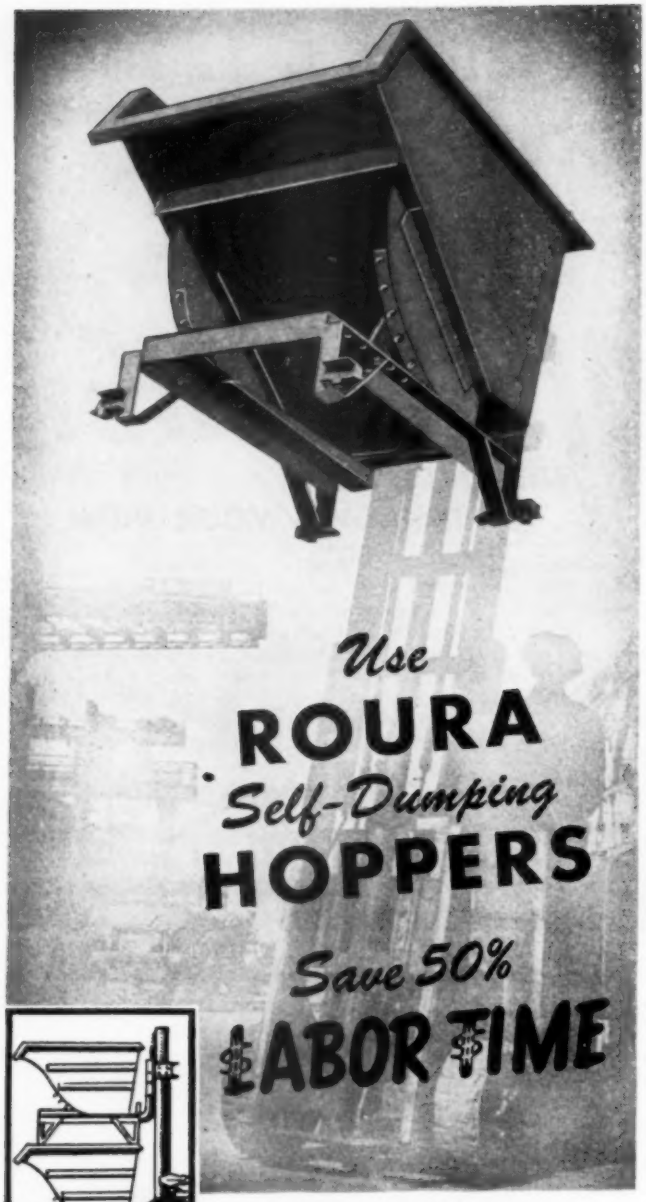

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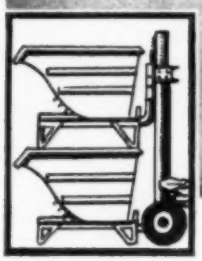

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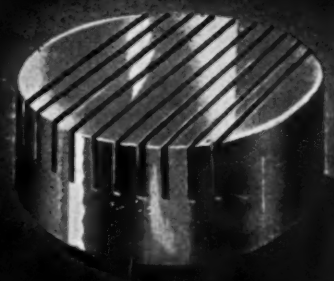

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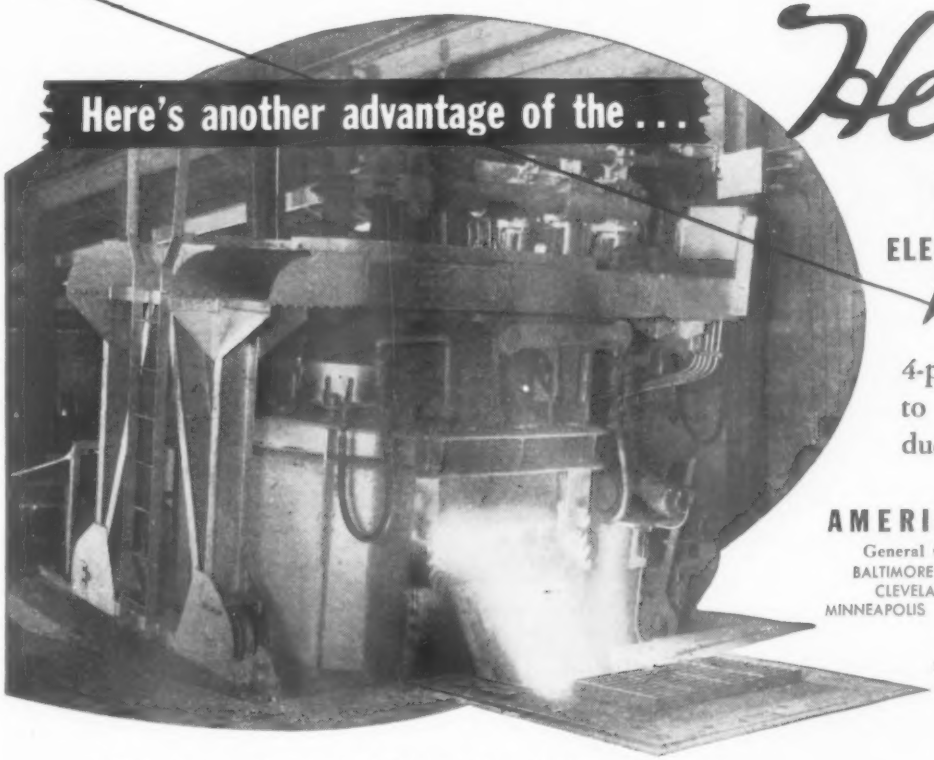

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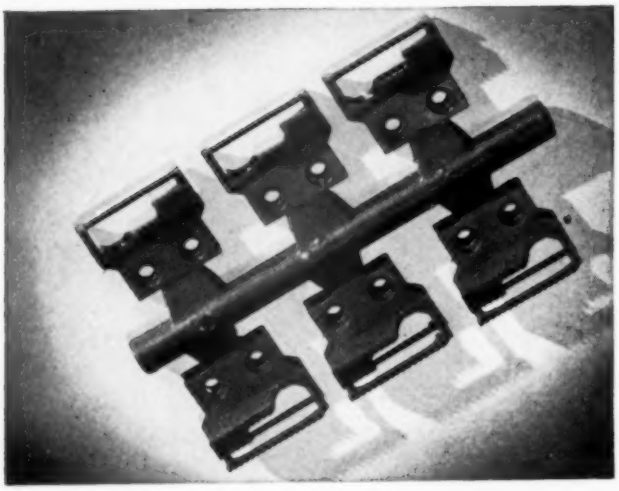

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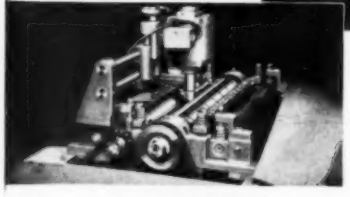

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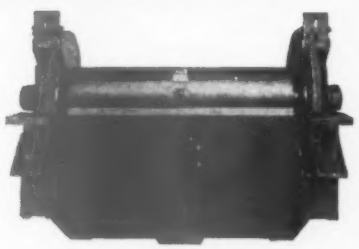

The Marschke Vari-Speed Grinder, the largest and most efficient of all heavy duty floor stand grinders, combines massive ruggedness with the dependability of accurately controlled wheel speed.

Constant cutting speed is automatically maintained by adjustment of the work rest to the wheel diameter. This machine may also be supplied as a Multi-Speed Grinder having three wheel speeds.

You'll want further information on the Vari-Speed Grinder or other Marschke Grinders which include pedestal and floor stand grinders and buffers, heavy duty Swing Frames and the "In-Between" Grinder.

Write today for complete details

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ALL CAPACITIES • ALL TYPES

Including Timken worm geared Ladles with *Industrial's* patented distortion-proof, self-locking design

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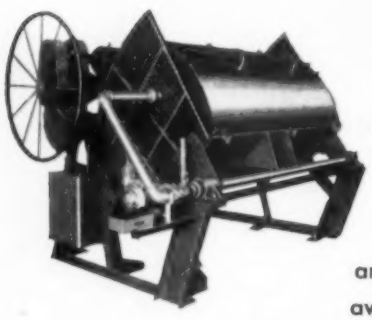

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Special geared motor-driven mixing ladle, an example of custom-build pouring and handling equipment available at INDUSTRIAL

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HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST

because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

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because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

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chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

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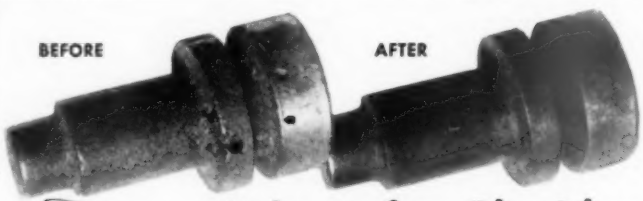

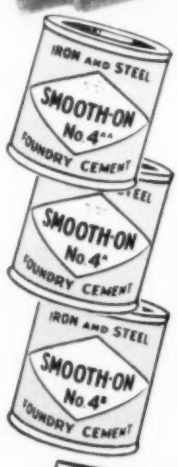

Make Surface Blemishes DISAPPEAR

Sand holes, blow holes, pock marks, dented edges make a casting unsightly—even though perfectly sound internally. Make these harmless blemishes practically invisible — with Smooth-On Foundry Cement. Leading foundries make this procedure as routine as trimming off "fins".

You can match color and texture. Smooth-On No. 4AA matches light gray, polished surfaces. No. 4A is for medium gray castings. No. 4B matches dark gray, coarser grained metal. These cements harden as part of the casting and stay in place, for they expand a little as they set.

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PIPE SIZE	1/16"	1/8"	1/4"	3/8"	1/2"
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FOR FAST CUTTING OF GATES AND RISERS OF ANY METAL

Removing gates and risers from steel, manganese bronze, hard and soft brass, aluminum and magnesium castings, as well as many other metal cutting jobs, are handled with great dispatch and surprising savings on TANNEWITZ VARIABLE SPEED BAND SAWS. And since they are available in any 3:1 to 6:1 speed ratio from 100:300 to 1000:6000 blade feet per minute, with instant adjustment to intermediate speeds, one machine serves ideally for cutting a variety of materials. Made with 30", 36" and 42" wheels.

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Don't scrap cast iron parts! Repair them...rebuild them... with NI-ROD

When these cast iron pump parts wore out, the question was... to repair them, or buy new ones.

Maintenance men decided to repair the parts, and keep an accurate account of costs for future reference.

The worn surfaces were built up with NI-ROD* weld deposit and ground to the original dimensions. Then the maintenance men did some arithmetic. A new pump body costs $11.76, not to speak of down-time waiting for the part to arrive. The total cost of the NI-ROD repair including labor, material and machining, was only $7.35, *a saving of $4.41 or 37%*. If you multiply this by the number of castings that give out during the year in your shop, you will understand the possibilities of repair welding with NI-ROD.

NI-ROD produces sound, *machinable* welds in cast iron without effort. Preheating is seldom necessary. NI-ROD produces a stable arc on both AC and DC, flows well, and makes a perfect bond with the iron.

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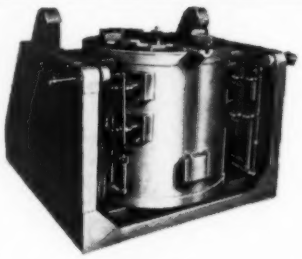
NON-FERROUS METAL MELTING FURNACES

SELECTION TABLE

	TYPE	Max. Temp.	Series	Recommended for	Bulletin No.
TILTING	CRUCIBLE	2500°F.	TCR	Melting Brass and Copper	TC-45
		1400°F.	TCA	Melting Aluminum	TC-45
	POT	1400°F.	TP	Melting Aluminum and Magnesium	TP-45
STATIONARY	CRUCIBLE	2500°F.	CR	Melting Brass and Copper	CR-45
		1400°F.	AC	Melting Aluminum	AC-45
	POT	1400°F.	AM	Melting Aluminum	AM-45
		1200°F.	SM	Melting Soft Metals	AM-45
		1000°F.	SA SAV	Melting Soft Metals	SV-45

26348



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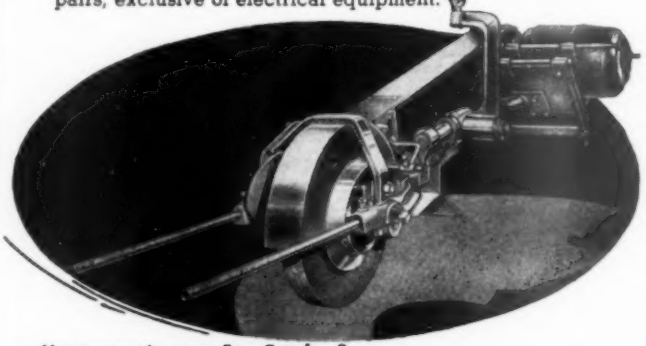

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The Favorite Blades of Non-Ferrous Foundries for Over 20 Years

You will profit by using the tougher Atlantic blades for clean, speedy cutting of gates and risers from castings. You can eliminate unnecessary grinding operations—our specially milled tooth construction makes it easier to cut closer to the body of the casting. All Atlantic Metal Cutting Band Saws are guaranteed as to material, workmanship and temper.

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Ruemelin Sand Blast Cabinets are designed for use in the smaller gray iron, brass or aluminum foundries. Built in many sizes. Furnished complete with dust control equipment. A Rotary Barrel 16″ in diameter can be installed in any of these cabinets to clean very small parts automatically.
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WEIGH ACCURATELY

For inventory control or wherever weights of parts must be checked, Dillon Dynamometers give the *right* answer. Also used to check tensile strength of castings, plastics, chain, etc. Maximum hand, direct reading in lbs. Not injured by overload.

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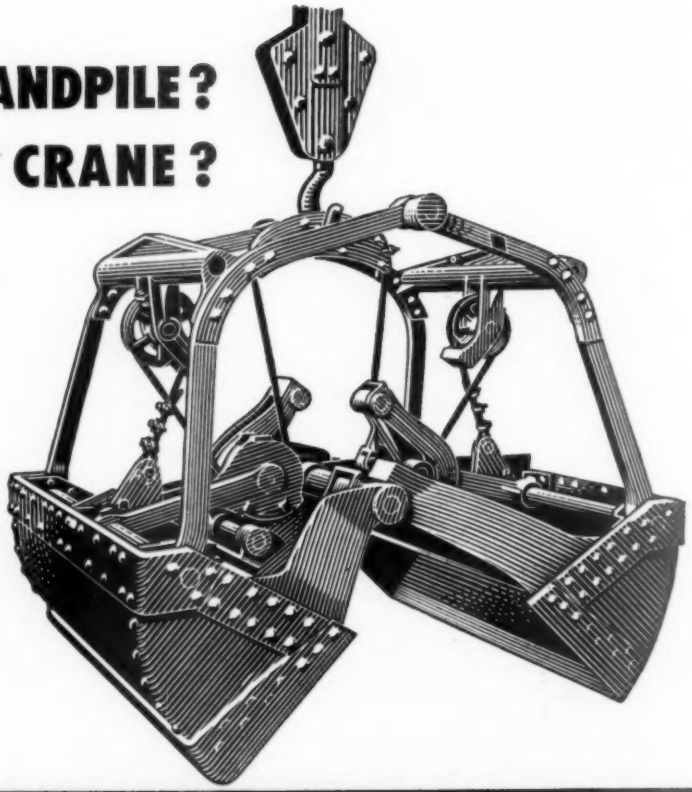

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SAVE "DOWN TIME" AND REPAIRS

OPERATE AIR TOOLS WITH

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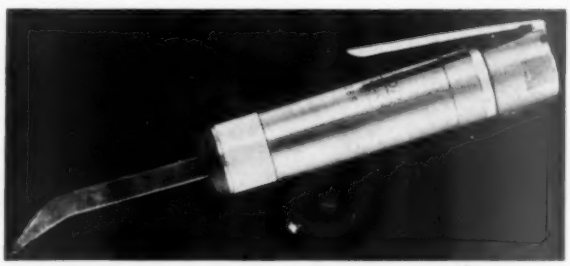

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FOR ITS ABILITY TO STAND UP UNDER REPEATED HARD USE

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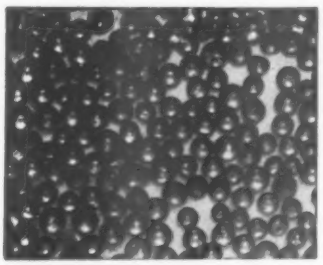

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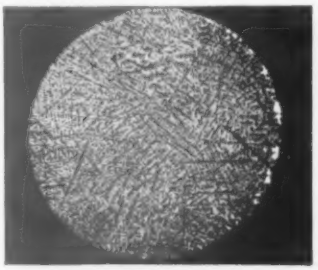

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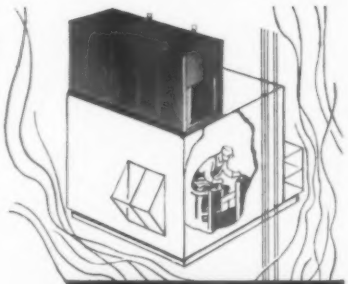

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REPEAT ORDERS from steel, iron and non-ferrous metal producers offer proof of the outstanding results where Dravo Crane Cab Coolers reduce fatigue and improve operator performance. It's worth your while to call or wire Dravo for case history details of these applications.

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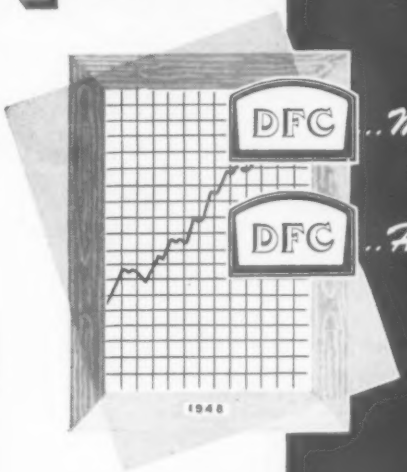

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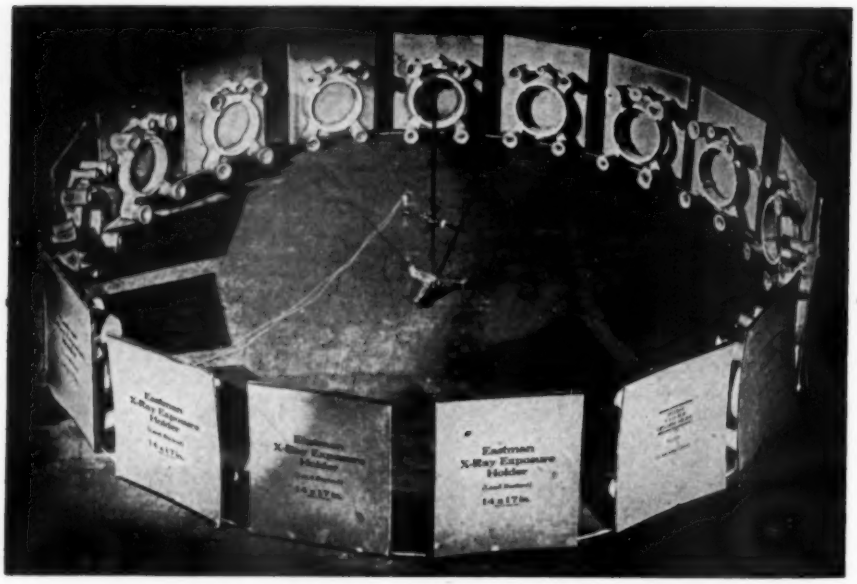

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"Directional solidification" can easily be studied by the set-up illustrated in the photograph—to indicate the best method of casting with a minimum of defects in the casting itself.

Radium has become a new foundry tool which directly effects an increase in yield. It permits accurate determination of the proper procedure in gating and risering "tough" castings. Seventeen cylindrical castings were radiographed simultaneously by Crane Co. to ascertain the most productive and economical foundry practice.

Radium thus performs a valuable additional function.

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JACKSON, OHIO

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This is the *Torit* No. 122 Dust Collector. It handles a large volume of abrasive dusts efficiently. There is a minimum of piping, and the cleaned air is recirculated, reducing heat losses. It runs only when the grinders are operating, and is easy to keep clean.

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HELPFUL LITERATURE

NOTE TO READERS: If you will check the item or items described which particularly interest you, we will be glad to request the manufacturers concerned to send you their literature. Use the attached postal card.

1. Dust Control

Sly Mfg. Co. — 24-page illustrated bulletin No. 98 contains information relative to engineering data, dimensions and capacities of Sly dust filters. These units operate on principle of multiple vacuum cleaners with number of filter bags in proportion to required capacity. Typical installations are shown.

2. Temperature Control

Leeds & Northrup Co. — 36-page illustrated catalog No. ND4A(2) presents recent development in Duration-Adjusting type electric control for regulating temperature of electric furnaces, salt pots and certain fuel-fired furnaces. It shows how control provides benefits of proportional control with automatic droop correction.

3. Feeders & Rotary Valves

Fuller Co. — 8-page illustrated bulletin No. F-3 shows and presents specifications of vane-type feeders for handling pulverized and granular materials and rotary valves for use under silo deck slabs and bins. Unrestricted opening of valves permits free flow of pulverized materials which have tendency to arch.

4. Foundry Equipment

National Engineering Co. — Four illustrated publications describe various types of foundry equipment for cooling of sand, preparing of sand and materials handling as well as Simpson intensive mixers for positive sand control. Publications total 80 pages, and they provide numerous photographs showing equipment in operation.

5. Electronic Potentiometers

Brown Instrument Co. — 32 page catalog No. 15-13 utilizes numerous schematic drawings, photographs and dimensional drawings to describe construction features and operating principles of ElectroniK Potentiometers. Instruments such as strip chart electric control, strip chart and circular chart recorders, precision indicators, and strip chart and circular controllers are described.

6. Dial Scales

Yale & Towne Mfg. Co.—Six technical bulletins totalling 68 pages provide data, diagrams, selection advice and practical application information on dial scales. One bulletin is devoted wholly to counting scales equipped with ratio pans to adapt scale to precise indication of numbers of parts handled in bulk. Other publications are devoted to bench scales and portable platform scales.

7. Plastic Fire Brick

Harbison-Walker Refractories Co.—6-page illustrated folder "Plastic and Castable Refractories" provides technical details and step-by-step directions for preparation and installation of these products. Plastic fire brick is suitable for applications such as boiler settings, oil burner installations, forge furnaces, annealing ovens and cupolas.

8. Lubricants & Compounds

E. F. Houghton & Co. — 6-page product index lists line of processing and maintenance products by trade names and applications. Categories include lubricants, metalworking oils and compounds, textile processing products, hydraulic and transmission beltings and packings, and leather oils and greases.

9. Trolley Conveyor

Smith Power Transmission Co.—4-page illustrated folder No. 551 deals with FlexoiD overhead cable trolley conveyor. Unit has been designed for easy installation and can be lengthened or shortened in minimum time.

10. Pipe & Fittings

National Carbon Co.—Illustrated catalog section No. M-88003 is descriptive of Karbate pipe and fittings. Comprehensive tables cover chemical and physical properties of material. Pipe sizes and fittings are charted for available sizes.

11. Chlorinated Rubber

Hercules Powder Co.—48-page illustrated booklet "Parlon," revised edition, gives new information on use of Parlon chlorinated rubber in protective coatings, printing inks, paper coatings, textile finishes and other applications. Charts showing how material speeds drying time of enamels and photographs of results of drying-time tests are included.

12. Metal Working Tools

Sheldon Machine Co.—16-page illustrated publication G-48 provides specifications and lists operating characteristics for 52 types and models of 10, 11 and 12-inch precision lathes, as well as shapers and milling machines. More than 70 accessories and attachments are described also.

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13. Air Hammer

Superior Mfg. Co. — Illustrated leaflet "The New Big Bully Air Hammer" describes air hammer which delivers approximately 9000 blows per minute and can be used for foundry chipping, heavy weld scaling, chiseling and routing, gouging and grooving, cutting and star drilling.

14. Materials Handling

Hewitt-Robins Inc., Robins Conveyors Div.—4-page illustrated bulletin No. 125-A shows examples of conveying and vibrating machinery and components, and it describes bucket elevators, car shakeouts, crushers, screens, winches, foundry shakeouts, dewaterizers and other materials handling equipment.

15. Blowers-Fans-Exhausters

General Blower Co.—16-page illustrated publication "Lungs For Industry" covers such equipment as turbo blowers, exhausters of many types, high temperature fans, exhaust fans, roof ventilators, insulation blowing machines, spray booth fans, and welding fume exhausters.

16. Portable Power Tools

Mall Tool Co.—Illustrated catalog form No. 746 contains photograph and construction and performance specifications of each product in line of portable power tools. Also described are interchangeable attachments which can be used to convert tools and expand their usefulness.

17. Valves, Strainers & Controls

A. W. Cash Valve Mfg. Corp.—32-page illustrated catalog No. D-14 presents detailed information on pressure reducing and regulating valves, refrigeration valves, strainers, hot water heating controls and pressure relief valves.

18. Gas Analyzers

Burrell Technical Supply Co. — 8-page illustrated bulletin No. 213 deals with line of Industro Gas analyzers applicable for such installations as combustion control, furnace atmosphere analysis, air leak detection, research and plant control, and calibration of automatic control instruments.

19. Industrial Furnaces

Denver Fire Clay Co.—28-page illustrated booklet "Industrial Furnaces" contains complete information on forge, heat treating, melting, laboratory testing, assay and special furnaces and ceramic pottery kilns. Details of fuel combustion equipment and refractory construction are included.

20. Motor-Generator Brushes

National Carbon Co. — Illustrated catalog section No. B-2106 tells of economy that can be effected by utilization of standardized carbon, graphite and metal-graphite brushes in motors and generators. Users can stock small supply to meet all needs.

21. Melting Furnace Hoods

American Air Filter Co.—4-page illustrated dust control bulletin No. 278A describes AAF furnace hood used in combination with Roto-Clone dust collector to control dust and smoke from electric melting furnace. Hood can be varied in design to fit any make of furnace. Also described is shakeout exhaust hood for severe foundry service.

22. Portable Power Tools

Syntron Co. — 24-page illustrated catalog No. 486 is descriptive of portable electric hammers, engine-driven paving breakers, electric vibrators, portable electric drills and screwdrivers, portable electric grinders and sanders. Details of accessories for use with these portable power tools are included.

23. Materials Handling Units

Brummeler Steel Products Corp.—4-page illustrated bulletin "Brusco Fabricators" shows various types of materials handling units such as overhead conveyor racks, casting cooling box, parts box, dump hopper and steel pallets.

24. Hardness Tester

Detroit Testing Machine Co.—1-page illustrated data sheet describes long stroke type Brinell hardness tester which is designed for checking large, heavy or awkward castings and parts. Both direct reading and plain types are listed.

25. Flexible Couplings

Ajax Flexible Coupling Co. — 24-page illustrated booklet No. 48 covers many types of flexible couplings including standard types S and A as well as shear pin, brake drum, bolt-on and detachable hub couplings. Data are given on forged steel and cast semisteel construction.

26. Molded Valve Packing

Edward Valves, Inc. — 4-page illustrated catalog section No. 12-R describes EValpak die-molded packing which is furnished in sets with each one containing two types of packing. Top and bottom rings of each set are wire-inserted jacketed rings, while center rings are die-molded plastic rings.

27. Industrial Equipment

Schmieg Industries, Inc. — 32-page illustrated catalog No. 481 offers comprehensive information concerning equipment such as dust and fume control units, spray booths, mechanical washers, industrial ovens and sheet metal equipment and accessories.

28. Switch Engines

General Electric Co.—8-page illustrated booklet GEA-4909 describes improvements made on standard models of 65 and 80-ton switching locomotives. Case histories and operating results for several switchers are included. Speeds and tractive effort are charted. Last page of publication is devoted to specifications.

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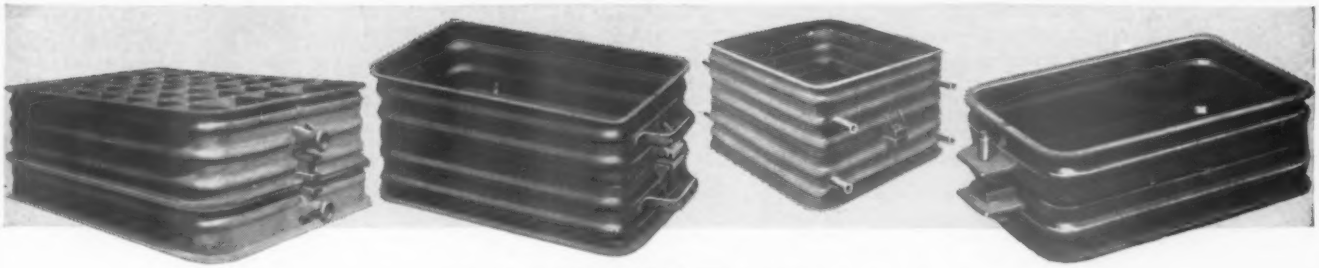

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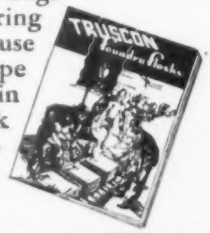

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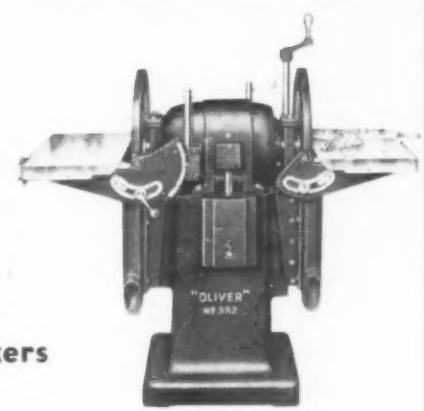

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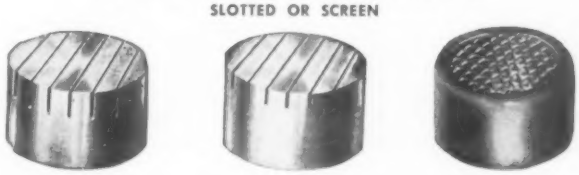

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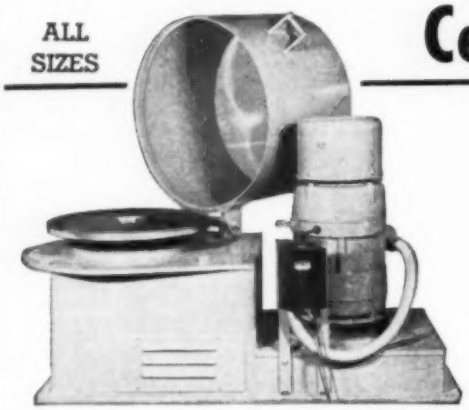

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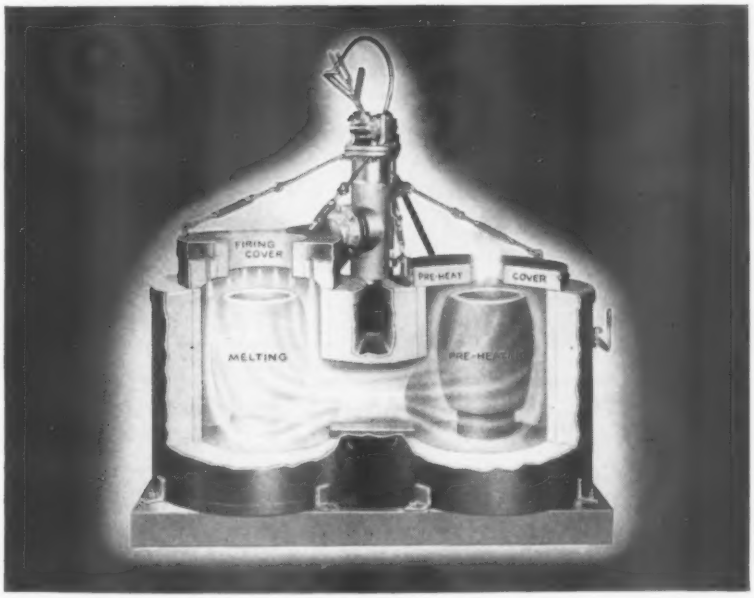

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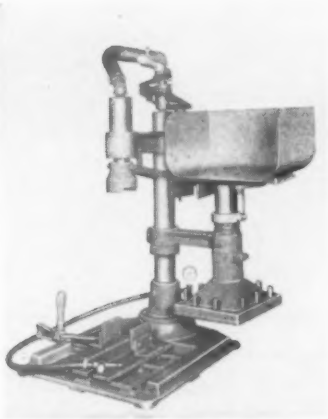

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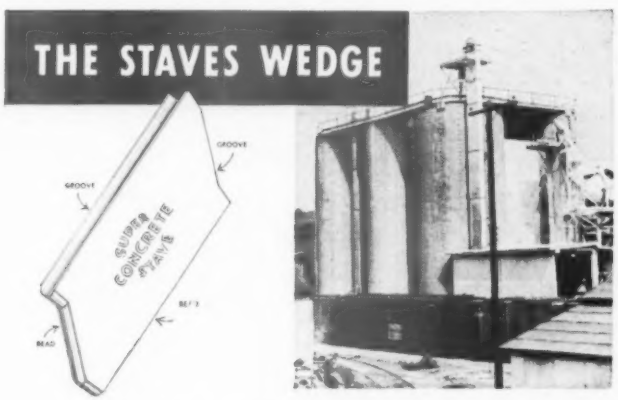

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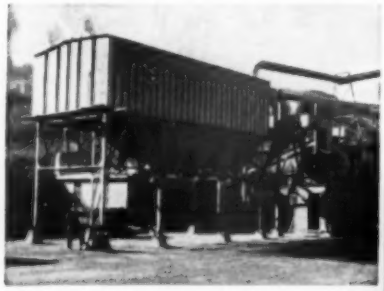

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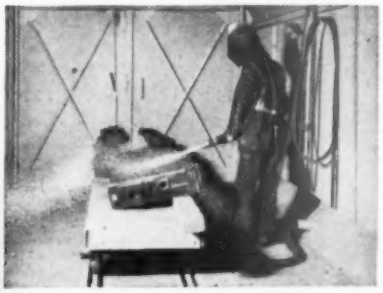

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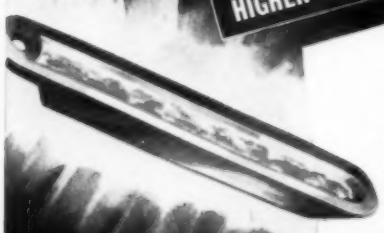

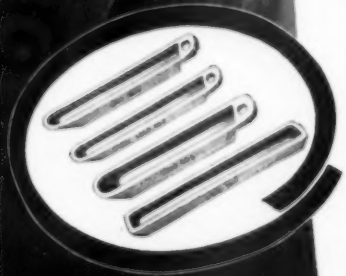

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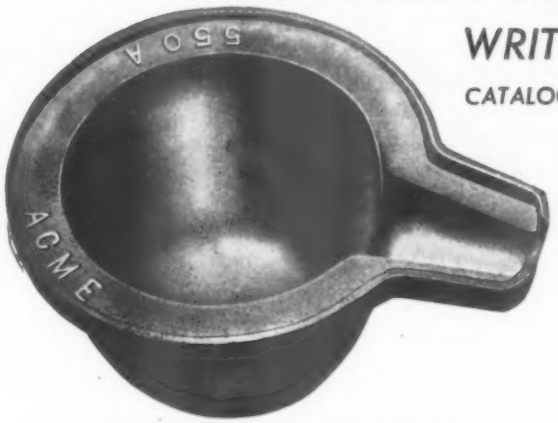

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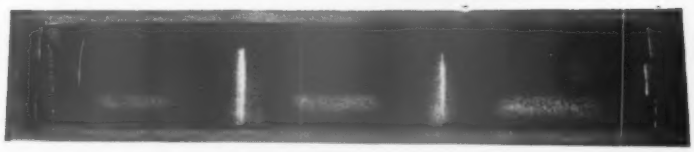

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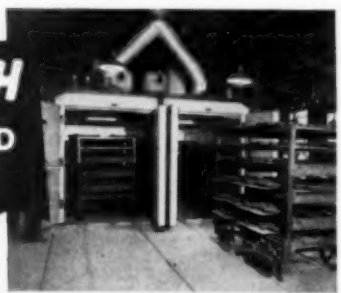

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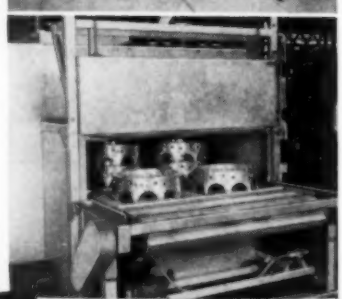

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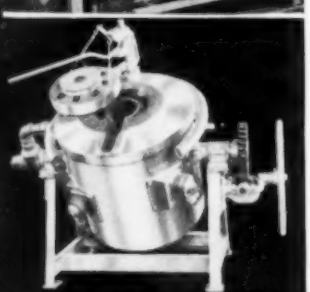

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FILTERS (Liquid)

Dollinger Corp., 36 Centre Park, Rochester 4, N. Y.

FINISHING EQUIPMENT

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.

FIRE BRICK

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Carborundum Co., Perth Amboy, N. J.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Norton Co., Worcester 6, Mass.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.
Stevens Inc., Frederic B., Detroit 16, Mich.

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Products Co., 1100 Second National Bldg., Akron, Ohio.

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

FLASK BUSHINGS

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

Diamond Clamp & Flask Co., Richmond, Ind.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Universal Engineering Co., Frankenmuth, Mich.

FLASKS (Aluminum)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C. C., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Shanafelt Mfg. Co., 2623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK FITTINGS

Adams Co., Dubuque, Iowa.
Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Diamond Clamp & Flask Co., Richmond, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.
Rietz Lumber Co., 1800 N. Central Park Ave., Chicago, Ill.

FLASKS (Wood)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.

FLEXIBLE SHAFT MACHINERY

Strand Co., N. A., 5001 N. Wolcott Ave., Chicago 40, Ill.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

American-British Chemical Supplies Inc., 180 Madison Ave., New York 16, N. Y.
Atlantic Chemical & Metals Co., 1925 N. Kenmore, Chicago 14, Ill.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Thiem Products Co., 647 East Virginia St., Milwaukee 4, Wis.
U. S. Reduction Co., E. Chicago, Indiana

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY ENGINEERS

Aimes Co., Inc., 2424 Euclid Ave., Cleveland, Ohio.

FOUNDRY LAYOUT & METHODS

Frank D. Campbell, 332 So. Michigan Ave. Chicago, Ill.
Engineering Service Inc., 610 West Michigan St., Milwaukee 3, Wis.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Reichert Engineering Co., W. G., 1060 Broad St., Newark, New Jersey.

FOUNDRY NAILS

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SUPPLIES

Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.

FOUNDRY SUPPLY HOUSES

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 7, N. Y.

FOUNDRY SUPPLY HOUSES (Cont'd.)

Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundries Materials Co., Coldwater, Mich.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FOUNDRY SYSTEMS

Engineering Seervice Inc., 610 West Michigan St., Milwaukee 3, Wis.
Reichert Engineering Co., W. G., 1060 Broad St., Newark, New Jersey.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Morrison Engineering Corp., 5005 Euclid Ave., Cleveland, Ohio

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 ColumbusRd., Cleveland 13, Ohio

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Surface Combustion Corp., Toledo 7, Ohio
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Despatch Oven Co., Minneapolis 14, Minn.

FURNACES (Annealing)

Campbell-Hausfeld Co., Harrison, Ohio.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Johnston Mfg. Co., Minneapolis 13, Minn.
Randall Foundry Equipment Corp., 4600 E. 71st St., Cleveland 5, O.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Electric Melting)

Ajax Electric Furnace Corp., 46 Richmond St., Philadelphia 23, Pa.
Philadelphia 23, Pa.
Ajax Electrothermic Corp.,

FURNACES (Electric Melting) (Cont'd.)

Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Greene Electric Furnace Co., 2702 6th So., Seattle 4, Wash.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Denver Fire Clay Co., 2301 Blake St., Denver, Colo.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
J. H. Lock & Sons Ltd., 150 Perth St., Toronto, Canada
Morrison Engineering Corp., 5005 Euclid Ave., Cleveland, Ohio
Randall Foundry Equipment Corp., 4600 E. 71st St., Cleveland 5, O.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Johnston Mfg. Co., Minneapolis 13, Minn.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.

FURNACES (Malleable Annealing) (Cont'd.)

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.
Young Brothers Co., 6508 Mack Ave., Detroit 7, Mich.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Johnston Mfg. Co., Minneapolis 13, Minn.
J. H. Lock & Sons Ltd., 150 Perth St., Toronto, Canada
Randall Foundry Equipment Corp., 4600 E. 71st St., Cleveland 5, O.
W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn.
Stroman Furnace & Engineering Co., Div of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Surface Combustion Corp., Toledo 7, Ohio
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.
Wilson Industries, 38 Memorial Dr., Cambridge 42, Mass.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp., Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE BOTTOMS

Industrial Silica Corp., Stambaugh Bldg., Youngstown, O.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
Fisher Furnace Co., 2453 West Hubbard St., Chicago 12, Ill.
Ironton Fire Brick Co., Ironton, O.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
United States Graphite Co., Saginaw, Mich.

GAGES

Acme Aluminum Alloys Inc., Dayton 3, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st Cleveland 5, O.

GAS BURNERS

Fisher Furnace Co., 2543 West Hubbard St., Chicago 12, Ill.
North American Mfg. Co., 4455 E. 71st St., Cleveland 4, O.

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.
C. Walker Jones Co., 6135 Lambert St., Philadelphia 38, Pa.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Willson Products Inc., Reading, Pa.

GRAPHITE

Acheson Colloids Corp., Port Huron, Mich.
Asbury Graphite Mills, Asbury, N.J.
Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
Superior Flake Graphite Co., 33 S. Clark St., Chicago 3, Ill.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17.
Independent Pneumatic Tool Co., Aurora, Ill.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Independent Pneumatic Tool Co., Aurora, Ill.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Surface, Bench, Disc, Floor)

Bridgeport Safety Emery Wheel Co. Inc., Stratford, Conn.
Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., Aurora, Ill.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.
N. A. Strand Co., 5001 N. Wolcott Ave., Chicago 40, Ill.

GRINDERS (Surface, Bench, Disc, Floor) (Cont'd.)

U. S. Electrical Tool Co., Cincinnati 4, O.
Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Desmond-Stephan Mfg. Co., Urbana, O.

GRINDSTONES

Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Div. Cleveland Quarries Co. 1740 E. 12th St., Cleveland, O.

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

HAMMERS (Chipping)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., 8 East 44th St., New York 17.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio
Dallett Co., 165 West Clearfield, Philadelphia, Pa.
Independent Pneumatic Tool Co., Aurora, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

HEAT CONTROL AND RECORDING DEVICES

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Claude S. Gordon Co., 300 So. Wallace, Chicago 9, Ill.
Illinois Testing Laboratories, 418 N. LaSalle St., Chicago 10, Ill.
Lindberg Engineering Co., 2450 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Gas, Oil, Electric)

American Wheelabrator & Equipment Co., Mishawaka, Ind
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio

HEATERS (Space, Unit, Direct Fired)

Dravo Corp., Dravo Bldg., Pittsburgh 22, Pa.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio
Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., 8 East 44th St., New York 17.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

HOISTS (Chain)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.

HOISTS (Electric)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Modern Equipment Co., Port Washington, Wis.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc., Springfield, Ohio.

HOIST (Electric) (Cont'd.)

Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

HOISTS (Hand)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.

HOSE (Air, Blasting, Water, Gas)

Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Pangborn Corp., Hagerstown, Md.
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Schramm Inc., West Chester, Pa.

HYDRAULIC CLEANING EQUIPMENT

Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff Inc., 208 W. 71st St., Cincinnati 16, O.

ILLUMINATORS (X-Ray Film)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

IMPREGNATING SYSTEMS

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

INDUSTRIAL ENGINEERING SERVICE

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Reichert Engineering Co., W. G., 1060 Broad St., Newark, New Jersey.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.

INGOT MOLDS

Acme Foundry Co., Detroit 16, Mich.

INGOTS (Nonferrous)

Ajax Metal Co., Philadelphia 23, Pa.
American Smelting and Refining Co., 120 Broadway, New York 5.
Apex Smelting Co., 2534 Fillmore St., Chicago 12, Ill.
Cleveland Electro Metals Co., W. 38th St. & NP RR. Cleveland 13, O.
Federated Metals Div., American Smelting and Ref. Co., New York 5.
International Nickel Co., Inc., 67 Wall St., New York City 5.
R. Lavin & Sons Inc., 3426 So. Kedzie Ave., Chicago 23, Ill.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Silverstein & Pinsof, Inc., 1720 N. Elston, Chicago 22, Ill.
Sonken-Galamba Corp., Kansas City 18, Kansas.
U. S. Reduction Co., East Chicago, Ind.

INJECTION MOLDING MACHINES

Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.

INOCULANTS

Carborundum Co., Perth Amboy, N. J.

INSULATORS (for Castings heads)

E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

IRON CEMENT

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE

Bethlehem Steel Co., Bethlehem, Pa.
Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.

JACKETS (Mold)

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Diamond Clamp & Flask Co., Richmond, Ind.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

LABORATORY EQUIPMENT (Chemical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.
Laboratory Equipment Corp., Benton Harbor, Mich.

LABORATORY EQUIPMENT (Physical)

W. C. Dillon & Co. Inc., 5410 W. Harrison St., Chicago 44, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.
Laboratory Equipment Corp., Benton Harbor, Mich.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Norton Co., Worcester 6, Mass.

LADLES

Bethlehem Steel Co., Bethlehem, Pa.
Haynes Foundry Equipment Co., 814 Ada St., Kalamazoo 21, Mich.
Industrial Equipment Co., Minster, O.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE HEATERS

Whiting Corp. 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS

Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, Ohio.

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Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
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Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
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Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
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Peerless Mineral Products Co., Conneaut, Ohio.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia, Pa.
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International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Raybestos Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE BENDERS

Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WIRE BRUSHES

Independent Pneumatic Tool Co., Aurora, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Redford Iron & Equipment Co., 21315 W. McNichols Rd., Detroit, Mich.

WOODWORKING MACHINERY

Do All Company, Des Plaines, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Oliver Machinery Co., Grand Rapids 2, Mich.
Parks Woodworking Machine Co., 1546 Knowlton St., Cincinnati 23, Ohio.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 West McGeoch Ave., Milwaukee 14, Wis.

ZINC

Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

—When writing advertisers, please mention THE FOUNDRY—

Classified Advertising

Help Wanted

MOLDING MACHINE SALESMAN

Established and growing foundry equipment manufacturer has opening for aggressive salesman experienced in foundry equipment sales. A real opportunity for the right man with foundry experience.

BOX 279

The FOUNDRY CLEVELAND 13, OHIO

CHEMIST

Young research chemist for foundry supply field —salary—permanent position.

BOX 265

The FOUNDRY CLEVELAND 13, OHIO

METALLURGIST

Metallurgist capable of operating induction ferrous furnace. Location middlewest. Address: Box 218, The FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

For captive cast iron and brass foundries of old, established hardware manufacturer near Philadelphia employing 40 molders. Experience required in training of machine molders; in the supervision of molders; coremakers, cupola crew, melting furnace operators, pourers etc. Applicants must be able to assume complete responsibility for operations. Address: BOX 314, The FOUNDRY, CLEVELAND 13, OHIO.

GENERAL FOUNDRY FOREMAN

Medium sized midwestern grey iron foundry melting 15 tons maximum per day needs experienced, energetic, orderly and capable foundry foreman. Must not be over 45 years old. Must be experienced in all phases of modern foundry, cupola and coreroom operation. Must be able to direct jobbing foundry work in the most efficient and practical production method. References requested. Address: Box 326, The FOUNDRY, Cleveland 13, Ohio.

MOLDING FOREMAN

Man needed to supervise molders in large mechanized grey iron foundry making small and medium sized castings. Works includes squeezers, bench, molding machines, etc. Excellent opportunity for advancement with long established firm located in Middle West. Give full work experience, personal data and salary expected in first letter. Address: Box 300, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

By old established agricultural implement concern in Eastern territory. Experienced in bench, floor, machine molding. Good opportunity for man who can control scrap and costs. Address: Box 269, The FOUNDRY, Cleveland 13, Ohio.

HEAD MELTER

Well established Eastern steel foundry has excellent opening for man in charge of acid electric furnace melting. In reply state qualifications, experience and salary desired. Address: Box 236, The FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

Qualified to take complete charge of metallurgical laboratory as chief metallurgist in the largest Magnesium Foundry in the Middle West. Must be a graduate Metallurgical Engineer and have at least 10 years of varied experience in Nonferrous metals. Capable of supervising metallurgical procedures for quality control and have the experience and knowledge to make customer recommendations of metallurgical requirements. In reply state age, experience and salary expected. ADDRESS: BOX 313, THE FOUNDRY, CLEVELAND 13, OHIO.

PATTERN MAKER

Steel, for cast iron fixture plant. Must be first class, good wages, steady, located in Eastern Ohio. Give full particulars. Address: Box 245, The FOUNDRY, Cleveland 13, Ohio.

Help Wanted

CORE ROOM FOREMAN

Experienced man for supervision of core room in the making of large and small cores for grey iron production foundry. Completely modern facilities for bench, air-machine and rollover work. Man selected must be thoroughly familiar with all phases of coremaking. Advancement assured the man with ability. A progressive firm located in the Middle West. State experience, personal data and salary expected in first letter. Address: Box 301, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Men capable of operating brass and aluminum smelting plant. Require man with experience in the manufacturing, buying and selling. Excellent opportunity with large concern located in midwest. Address: Box 267, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

For gray iron, brass, bronze and aluminum jobbing shop in Eastern Georgia. Must be capable of taking complete charge of foundry operations. Submit experience, age, references and salary desired. Address: Box 268, The FOUNDRY, Cleveland 13, Ohio.

Manufacturer's Agents

SALESMEN

Wanted for leading manufacturer of foundry equipment. Applicants must have a thorough background of foundry engineering. Must have a car for traveling purposes. Territories open nationally. Specify complete background, territory desired and remuneration. Address: Box 310, The FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVES WANTED

Salesmen everywhere, work glove side line, 5%. Address: PARKER SAFETY EQUIPMENT, 41, IRVINGTON 11, N. J.

MANUFACTURER'S AGENTS

To sell patented lighting fixtures to industrial plants, large potential, no inventory required, protected territory, 25% commission. See our ad in November issue, page 253. Address: MIDWEST LIGHTING PRODUCTS CO., P.O. BOX 536, EDGEWATER BRANCH, CLEVELAND, OHIO.

FOUNDRY EQUIPMENT MANUFACTURER

Interested in securing additional representation in Western Pennsylvania, Southern Ohio, Kentucky, Virginia, Texas and Louisiana. Please write: Box 270, The FOUNDRY, Cleveland 13, Ohio.

SALES REPRESENTATIVES

Factory representative capable of assisting district representatives by nationally known manufacturer of dust control and ventilating equipment. Address: Box 280, The FOUNDRY Cleveland 13, Ohio.

Positions Wanted

SALES REPRESENTATIVE

Selling ferrous and nonferrous sand and permanent molds, castings, high production. Prefer middle west. Address: Box 315, The FOUNDRY, Cleveland 13, Ohio.

COREROOM SUPERINTENDENT

More than 20 years' experience specializing in plowing machines and sand mixing for all kinds of core room machinery—large and small work, gas and diesel precision dry sand molds and machine tool castings. Eastern Texas preferred. Address: Box 213, The FOUNDRY, Cleveland 13, Ohio.

MANAGER OR SUPERINTENDENT

30 years' foundry experience in molding and melting grey iron. Understand bench, floor, pit, all types molding machines and was superintendent of dry sand molding. Understand melting with cupola, air furnace and the new type oil-fired reverberatory furnace. 12 years of the 30 managing experience. Age 50. Address: Box 319, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

GREY IRON SUPERINTENDENT OR MANAGER

Wants position with progressive foundry. Excellent practical and technical education, middle age, good health, pleasing personality and results guaranteed. References. Address: Box 296, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON SUPERINTENDENT OR MANAGER

Capable of taking complete charge of foundry desires connection with jobbing or production foundry. Expert in squeezers, rollovers and sand slinger. Will go anywhere. Address: Box 307, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY SUPERINTENDENT

Wishes connection with progressive foundry. Practical man with long experience operating shops in East and Midwest. Experienced on railroad, pressure, automotive work and other lines. Thoroughly familiar with bench, machine and floor molding operations. Address: Box 312, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Metallurgical engineer with 12 years' experience in wide variety of metallurgical problems—research, development, control and trouble shooting in malleable, gray iron and steel foundries. Desires responsible position with progressive firm. Address: Box 288, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRYMAN

Desires position in progressive steel foundry. Age 38 years; married; high school graduate; I.C.S. course in foundry practice; trade school in general machine shop and drafting. Eighteen years' general foundry experience. Six years' foreman. Experienced in floor and bench work; all types machine molding a specialty. Some cleaning and core room practice. Address: Box 283, The FOUNDRY, Cleveland 13, Ohio.

SAND CONTROL AND MELTING FOREMAN

Ten years' experience, specializing in melting and sand control in malleable, gray iron, semi-steel, brass and aluminum. McLain graduate and graduate of foundrymen's course, I.C.S. 6 years' experience as foreman and superintendent. Now employed, age 37. Address: Box 299, The FOUNDRY, Cleveland 13, Ohio.

PRACTICAL FOUNDRYMAN

With 20 years' experience as assistant superintendent and superintendent. Now employed as superintendent. Experienced on light, heavy, pit and machine molding in both steel and iron. References if desired. Address: Box 304, The FOUNDRY, Cleveland 13, Ohio.

STEEL FOUNDRY MANAGER

A proven record of ability to organize, control cost, quality, production and maintain good labor relations. Metallurgical engineering graduate with fifteen years of practical experience, 37 years of age, at present employed as manager. Address: Box 309, The FOUNDRY, Cleveland 13, Ohio.

FOREMAN

Desires position as foreman or superintendent. Practical man. Twenty-two years' experience from molder to foreman gray iron or nonferrous, soil pipe and fittings. Prefer Western or Central New York. Address: Box 201, The FOUNDRY, Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Young man desires position in Michigan-Ohio district, others considered; 15 years' experience in handling castings up to 15-ton, including carbon, alloy and flame-hardening steel. Address: Box 327, The FOUNDRY, Cleveland 13, Ohio.

GRADUATE METALLURGIST

Age 34. Ten years' experience in responsible metallurgical position in automotive gray iron foundry. Wide experience in cupola melting, sand control, metallography, physical testing, melting supervision, etc. Desire position as research or operating metallurgist. Will consider responsible supervisory job. Address: Box 305, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

FOUNDRY SUPERINTENDENT

And supervisor desires position with electric steel foundry making small and medium size castings. Thoroughly experienced in cost, budget system and man hours control. Address: Box 277, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN

Young man desires position in automotive, farm implement or other production work. Also have 14 years' experience in supervision on cast iron bathtubs, sinks, etc. Know all phases sand, cupola and modern production methods. Excellent references. Address: Box 335, The FOUNDRY, Cleveland 13, Ohio.

CORE ROOM SUPERINTENDENT OR FOREMAN

Grey iron-steel-brass-aluminum. 14 years' experience all types cores, core mixes and machines. Specialty core blower. Ability to set up and operate production core room efficiently. Employed. Desires Western location. Address: Box 240, The FOUNDRY, Cleveland 13, Ohio.

STANDARDS & METHODS SUPERVISOR

Desires connection with a good progressive concern who wants increased production and reduction in cost. Very capable leader and able to get along with labor and supervisor. Will also assist management in cost control and operation of plant. Have had several years' experience in the malleable, steel, grey iron and aluminum foundry industries. Prefer Chicago, Milwaukee or West Michigan area. Address: Box 318, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Practical foundryman with technical training. Thirty-two years' experience, including fifteen years of supervision. Well versed in all phases of jobbing and production work on light and medium castings. Progressive and up-to-date in modern methods. Capable of taking complete charge of medium size foundry. Available on short notice. Address: Box 285, The FOUNDRY, Cleveland 13, Ohio.

CLEANING ROOM FOREMAN

Young man desires connection with midwestern foundry. Thoroughly experienced in handling small and medium sized carbon and alloy electric steel castings. Address: Box 303, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Young A-1 nonferrous foundryman. Experienced in molding, machines, metals, coremaking, prices, production and jobbing. Capable of handling men and taking complete charge of all operations. Address: Box 308, The FOUNDRY, Cleveland 13, Ohio.

NONFERROUS FOUNDRY MANAGER—SUPERINTENDENT

Over 30 years' practical experience on both large and small work. Thoroughly experienced in the use of sand slinger and core blowing jobbing and production. Address: Box 322, The FOUNDRY, Cleveland 13, Ohio.

PLANT MANAGER

Twenty-two years' experience in gray iron. Have excellent qualifications. Several years' experience as a plant manager. Understand administrative end as well as practical end of business. Address: Box 276, The FOUNDRY, Cleveland 13, Ohio.

ASSISTANT TO GENERAL MANAGER

Industrial engineer (B.S.), married, age 35 with excellent working knowledge of foundry practices wishes to contact modern progressive gray iron foundry (with machine shop). Can handle all phases of industrial engineering as well as labor relations. Available upon short notice. Address: Box 329, The FOUNDRY, Cleveland 13, Ohio.

GENERAL FOREMAN

Age 40, eighteen years' supervisory experience on production molding. Familiar with sandslingers. Have full knowledge of sand and melting, gray iron or steel. References. Address: Box 336, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT OR SUPERVISOR

Experienced foundryman, age 37 desires position with a good jobbing or production foundry. Know all phases of foundry operations to produce quality work in gray iron, semi steel or steel. Address: Box 258, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY EXECUTIVE

Desires connection with progressive foundry. Age 42, married, 23 years' practical experience in iron, steel and manganese. Eleven years' in foundry supervision and management. Have training in Lincoln Extension Institute. At present time employed with Mid-West company. Address: Box 290, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT—MANAGER

Age 47-thirty years' practical experience from molder and melter to executive capacity in jobbing, machine and production foundries. Good rigger on all phases of pattern and molding procedure. Would like to make connection with reliable company needing the services of a high grade foundryman with a good record. Prefer Midwest or West. Address: Box 325, The FOUNDRY, Cleveland 13, Ohio.

JANUARY GRADUATE IN METALLURGICAL ENGINEERING

Age 24. Single. Former army officer. B.S. from large midwest university. Desires responsible starting position with small or moderate size foundry, ferrous or nonferrous where opportunities are present for obtaining a broad knowledge of the foundry industry. Address: Box 332, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR MANAGER

Graduate engineer with 22 years of operating experience in jobbing and high production of light and medium castings wants a position of top responsibility in a modern ferrous or nonferrous foundry. Address: Box 324, The FOUNDRY, Cleveland 13, Ohio.

PATTERNMAKER

Thirty years' experience wood, metal and plastic patterns and models. Capable foreman of large shop or working foreman small shop. Can take complete charge, estimate layout work, supervise men or train apprentice. Foundry trouble shooter on pattern work. Can go anyplace. Address: Box 320, The FOUNDRY, Cleveland 13, Ohio.

PERMANENT MOLD FOUNDRYMAN

Graduate engineer of proven ability in design and operation of permanent molds for aluminum. Fully practical, handle all phases from estimating to finished casting. Address: Box 286, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY INDUSTRIAL ENGINEER

B.S., age 43, 10 years' experience in modern production methods and in the establishment of standard data accepted by unions for all types of foundry machines, automatic molding equipment and hand work. Presently employed as Head of Stds. Dept. in gray iron foundry with 750 personnel. Address: Box 328, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT—GENERAL FOREMAN

Thirty years' practical experience on medium and heavy jobbing work. Ten years' foreman and superintendent in gray iron shop pouring 30 to 40 tons per day. Would like to make change at once. Address: Box 323, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM PERMANENT MOLD FOUNDRY ENGINEER

TWENTY-FIVE YEARS' EXPERIENCE AIRCRAFT PARTS OR ANY INTRICATE WORK. FULL OR PART TIME. OHIO AREA OR METROPOLITAN NEW YORK LOCATION PREFERRED. ADDRESS: HAROLD C. HAASE, 557 SOUTH FOREST DRIVE, WEST ENGLEWOOD, NEW JERSEY.

GENERAL MANAGER

With long, valuable experience in managing, building up and maintaining foundry and machinery business on profitable basis, invites correspondence preliminary to interview. Ability to direct all office, sales, financial and production activities efficiently and economically unquestionably established by previous record. Address: Box 946, The FOUNDRY, Cleveland 13, Ohio.

BRASS FOUNDRY FOREMAN

Desires position with progressive jobbing foundry. Cost minded, aggressive and can get things done. Practical molder and coremaker technically trained. Address: Box 337, The FOUNDRY, Cleveland 13, Ohio.

Open Capacity

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

Opportunities

90 PER CENT OF THE CUPOLAS MELT UP TO ONLY 50 TO 60 PER CENT

capacity per hour—although the best and hottest iron is produced only when cupola is operated to its capacity. Report on your cupola may prove an eye-opener—usually the savings are surprising. Every pound of steel used in cupola mixtures reduces cost and increases strength 20 to 60%, because steel is purer than the most expensive pig iron. Watch the scrap pile—statistics prove casting losses can be held between 1 to 5% depending on the line of work. Our system is not an expense—but a valuable investment. Synopsis free.

McLAIN'S SYSTEM INC.
236 E. NORTH AVE.
MILWAUKEE, 12, WIS.

OPPORTUNITIES

Want to contact parties who can manufacture and market adjustable flask clamp-telescope type which doubles itself in length. Address: GEORGE E. CARLIN, 945 N. 5th AVE., TUCSON, ARIZONA.

OPPORTUNITY

We can furnish at any point slack, fibre and tight barrels; also fibre and steel drums. Address: BUCKEYE COOPERAGE COMPANY, 3807 ORANGE AVENUE, CLEVELAND 15, OHIO.

Wanted-To-Buy

WANTED

DeWalt ME-2 foundry machine, used for the removal of gate, risers, etc.—large table and swinging arm, manufactured by DeWalt, Inc. of Lancaster, Pa. Address: Box 263, The FOUNDRY, Cleveland 13, Ohio.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Pattern equipment for A, AB and C line V-belt sheaves and other power transmission equipment. Address: Box 273, The FOUNDRY, Cleveland 13, Ohio.

PATTERNSHOP WANTED

Experienced patternmaker wants part interest or to buy patternshop. No special location preferred. Address: Box 321, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Steel foundry making in considerable tonnage at low cost, steel castings and ingots or billets. Address: Box 215, The FOUNDRY, Cleveland 13, Ohio.

WANTED TO BUY

Horizontal centrifugal casting machine also several jolt squeeze pin lift machines with a minimum squeeze cylinder of 18" diameter. Address: Box 316, The FOUNDRY, Cleveland 13, Ohio.

For Sale

FOR SALE

New heavy duty motorized rod cutter, 65 cuts per minute; capacity: ¾ inch round hot rolled steel. Brand new, $890.00 f.o.b. Cleveland. Address: The Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.

FOR SALE
CLEANING EQUIPMENT

American Wheelabrator tumblast 30" x 42", 100 series, serial A-7372. Address: CALHOUN FOUNDRY CO., INC., HOMER, MICHIGAN.

Classified Advertising

For Sale

1 #2 American Gas Furnace, Elizabeth, N. J., Annealing.
2 Gehnrich Core Ovens, Height 96", Depth 88", Width 69"
73 Sterling Steel Flasks, 10 x 20 x 5½ x 5½
6 #1 Johnson & Jennings Moulding Machines.
Serial #1159-2870 Serial #1159-2866
Serial #1159-2862 Serial #1159-2861
Serial #1159-2860 Serial #1159-2863
1 #2 Johnson & Jennings Moulding Machine. Serial #1003-3171 never used
1 53" Gardner Surface Grinder, motor driven
1 Electric Oven, Federal Mfg. Co., 4 drawers, max hgt of core 2"
1 Porter Cable Wet or Dry Vertical Belt Grinder, Syracuse, N. Y. Type BG-S, Serial No. 7146
1 Beardsley & Piper Screenarator No. BP-11812
1 Link Belt Speed Reducer, Size T-10LH, Order H-27881-F10 Input RMP 1380, Output 10.1, Ration 136.4, Service Factor 1. 16.5 Input H.P.
2 Spencer Turbo Compressor—420 C.F.M., .55 oz., 15 H.P., 3 PH 60 cycle, V. 220, RPM 3500
1 Besley Grinder #214, Serial #214-30061, Model 5KF, 405 FPI, Type KF, Volts 220/440, 3 PH, Cycle 60, Speed F.L. 1170, 25 HP
5 Adams Slip Flasks, 18 x 18 x 4 x 5
3 Hines Flasks, 10 x 20 x 4 x 4
7 Tabor 10" Squeeze Cylinder Machines, squeeze & jolt squeeze
2 Tabor 12" Squeeze Cylinder Machines, squeeze & jolt squeeze
1 Pangborn Airless Rotoblast Table, Steel Shot Cleaning Machine 6', ½ Type LG, 9" Serial #6LG9-43, with motors as follows: Elevator 1½ H.P., 1200 RPM, Rotoblast Wheel 15 H.P., 1800 RPM, Separator ¼ H.P., Table 1½ H.P., 1200 RPM, Spider with 12 auxiliary tables with vari-speed. Pulley @ 3 to 1 ratio. 1 Rev in 3 minutes to 1 Rev in 1 minute.
1 Hanging Electric Riddle—Emerson Elec. Mfg. Co. 36" diameter ½ H.P., #H36TS26, S3830 E.J., 208 Voltage, 60 cycle.
1 Brownie Lift Truck, 108" Lift, Model FHLT 3000, No. F 1132 Berry Motor Car Company.
1 Fordson Tractor
1 Beardsley & Piper Sandslinger, Stationary Type, Swivel Arm

NATIONAL FOUNDRY COMPANY OF NEW YORK, INC.
10 SANDFORD ST. BROOKLYN 5, N. Y.

SCHUTTE & KOERTING TUMBLING & WASHING BARREL

Tilting type, 1 gear head motor to rotate barrel, 1 gear head motor to raise and lower barrel, inside dimensions of barrel 24" deep x 28" wide, 1¾" bronze. Motor characteristics 220/440/60/3. Excellent condition. At a fraction of original cost. $375 f.o.b. Mansfield, Pa.

BILLARD MACHINE & TOOL CO.
PHONE 240 MANSFIELD, PA.

ROTARY POSITIVE BLOWERS IN STOCK TODAY!!!

28x30	6700 CFM	7 lbs.
20x60	6150 CFM	2 lbs.
20x30	3560 CFM	3½ lbs.
16x24	3210 CFM	5 lbs.
16x21	2125 CFM	5¾ lbs.
16x48	2430 CFM	2 lbs.
14x42	2880 CFM	2 lbs.
14x36	2190 CFM	1½ lbs.
12x18	1500 CFM	4½ lbs.
10x15	850 CFM	3½ lbs.

And many smaller Roots-Connersville and Sutorbilt Rotary Positive Blowers, Spencer—Sturtevant—North American and General Blower Turbo Blowers. Also Steel Plate Dust Exhausters.

SEND US YOUR INQUIRIES.
WM. W. MEYER & SONS
8309 NILES CENTER ROAD
SKOKIE—ILLINOIS

FOR SALE

Used Universal tensile testing machine. Good condition. Type MP-10, motor driven, hydraulically operated. Address: Box 334, The FOUNDRY, Cleveland 13, OHIO.

STEEL TUBING

Steel seamless tubing—2½" OD—1½" ID. Large quantities in 10 ft. to 14 ft. lengths. Also 25 ton of same in 2¼" OD—1¼" ID. Specification N.E. 9650. Price: 6¾c per lb., f.o.b. Bettendorf, Iowa. Address: RIVERSIDE FOUNDRY, BETTENDORF, IOWA.

For Sale

LIST OF EQUIPMENT FOR SALE

5—#2 Simpson Mixers with and without loader, all have motors.
16—J-275 Osborn Jolt Squeezers.
1—Model "AA" Sand Cutter.
1—Schramm Air Compressor, direct drive, 20 H. motor.
1—#91 Osborn Core Blower.
4—JDP Jolt Strippers.
5—"G" International 20 x 8 Rollover Machines.
1—International "G" Type 24 x 10 Jolt Rollover Machine.
4—Beardsley & Piper Screenarators.
1—Jeffrey Screenarator.
1—"Jr." Royer.
1—"B" Royer.
1—Swing Grinder, 5 H. Motor.
1—Plain Jolt Machine 40 x 60 Table.
1—32 x 72 Tumbling Mill—inside measurements.
1—32 x 82 Tumbling Mill—inside measurements.
38 Kegs Horseshoe Nails for Steel Foundry.
4 bbls. 14 gauge Chill Coils.
1—Type R, 14 x 8 International Rollover Machine.
And many other articles too numerous to mention.

HAYNES FOUNDRY EQUIPMENT CO.
814 ADA ST. KALAMAZOO 52, MICH.

FOR SALE

1—42" Whiting cupola with blower, practically new.
1—8' Sly Centi Blast Table.
1—Buffalo U. S. Standard tensile testing machine.
1—Seven ton Paxton tilting ladle, never used.
2—Modern Equipment ladles 400# and 600#.
1—Square tumbler 26 x 26—59" long.
3—Grinding wheel stands.
1—SPO stationary jolt squeezer, swing arm type.
1—SPO stationary jolt squeezer, cantilever Squeeze head.
2—Davenport rollovers 2600# jolt 12" draw, table 33 x 50.
1—Pridmore rollover 10" draw, table 24 x 24.
3—Osborne rollovers, small sizes on application.
1—2½ ton Herman rollover, 5 ton bumper, 48" draw table 50 x 72.
1—Nicholsen Jolt-squeeze stripper, table 12 x 20.
1—Haynes shake-out vibrator.
1—Gasoline high lift Baker lift truck.
3—One ton electric hoists.

WASHINGTON FILLMORE FOUNDRY, INC.
153 FILLMORE AVE. BUFFALO 10, N. Y.

FOR SALE

TURBO GRINDERS
(2) 2200 cfm @ 2½ lb. Spencer Turbo Blowers with 40 HP 3 phase 60 cycle 3600 RPM totally enclosed fan cooled motors.
1675 cfm @ 2½ lb. Spencer Turbo Blower 30 HP 3 phase 60 cycle 3600 RPM totally enclosed fan cooled.
1400 cfm @ 16 oz. Spencer with 220/440 volt 3 phase 60 cycle motor.
150 cfm @ 3 lb. Spencer with 5 HP 3600 RPM motor.
PRESSURE BLOWERS
2500 cfm @ 7 oz. Sturtevant with 15 HP 3/60/220/440 volt motor.
2300 cfm Clarage with 2 HP 3/60/220 volt motor.
1400 cfm @ 8 oz. Robinson with 5 HP, 3/60, 3600 RPM motor.
1100 cfm @ 16 oz. Sturtevant.
450 cfm @ 6 lb. A & B with 30 HP motor.
250 cfm @ 12 oz. GE with 2 HP motor.

THE MOTOR REPAIR & MFG. CO.
1522 HAMILTON AVENUE
CLEVELAND 14, OHIO

FOR SALE
WHEELABRATOR

American 27 x 36 tumblast. Excellent condition. Bargain.

P. O. BOX 5104
INDIANAPOLIS, INDIANA

FOR SALE

One International core rollover and draw machine, size 30 x 16, type AN, serial #46505, draw 12" to 30", table 28" x 42". Complete with pneumatic holddown, five coremaking stations and conveyors for complete setup. Address: ST. MARYS FOUNDRY CO., ST. MARYS, OHIO.

For Sale

EQUIPMENT FOR SALE

MOLDING MACHINES
3—75J Osborn Jolt Squeeze
2—SPO #611-B Stationary, Oscillating, Jolt, Squeeze Strippers
1—SPO #4½ JHS Air Jolt Hand Strip
1—Tabor Plain Squeeze, Strain Rod Type
3—Mumford 3" Cyl. Core Jolt, with 20" x 15" Table
BLOWERS FOR CUPOLAS AND FURNACES
6—#S05 General Blowers, 5 HP, 3/60/220, 1400 CFM at 8-oz. pressure
Maxon-Premix Blowers for Gas, ½ to 1 H.P.
METAL MELTING EQUIPMENT
1—Recirculating Gas Fired Oven with all controls, suitable for Core Oven
2—Hausfeld 1000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired
2—Hausfeld 2000# Aluminum Capacity Furnaces, Barrel Type, Open Flame, Oil Fired
3—Stationary Gas Fired #60 Crucible Furnaces, with ¼ H.P. Maxon-Premix Blowers
2—Monarch-Rockwell Rotating, 500# Brass, Oil New 32" to 41" Dia. Shell Cupolas made to order.
TUMBLING MILLS AND SAND BLAST
1—American Foundry Equipment Co. No. 1 Multi-table Wheelabrator with 12-8" dia. work tables. Complete unit.
2—Pangborn No. 2 GH direct pressure type sandblast barrels, motor driven. Complete units.
1—Pangborn LE 6 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn LE 4 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn Sand Blast Unit including generating tank, shot cleaner, bucket elevator and dust collector with motor. Suitable for use with room.
MISCELLANEOUS
4—Heavy duty flexible shaft grinders 2 HP
30—Jib Cranes. Floor Type. 1000 to 2000 lbs. capacity, 180° swing, 10 to 15 ft. arms
30—1000 lbs. Capacity Budget Electric Hoists
5—Low Lift Electric Trucks, 2000 lbs. capacity and up. Riding Operator Style
1—Heavy Duty Back Geared Sprue Cutter, 1¼" square knives, T & I, Pulley Drive
1—5 x 10' Simplicity Shakeout, complete with motor.
Miscellaneous Electrical and Gravity Conveyor Systems

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

FOR SALE

65—800 lb drums of
DELTA GRAKOAT

3—500 lb. drums of
DELTA CHILLKOAT

This material is in good condition and can be inspected at any time at our plant. We are willing to accept any reasonable offer for this material f.o.b. our plant.

Direct inquiries to W. F. Pfeiffer, Purchasing Agent.

MACK MANUFACTURING CORP.
NEW BRUNSWICK, N. J.

FOR SALE

1—Schneible Multi Wash dust collector type J. C. capacity 8000 C.F.M.
1—Clarage No. 21 fan.
1—25 H.P. 3 phase 60 cycle motor—220/440 volts with sheaves and "V" belt drive.
1—Schneible 300 gal. twin dewatering tank.
1—Schneible No. 2—50 G.P.M.—35 Ft. Head, wear proof sludge pump mounted on cast iron frame, direct connected with a 2 H.P. Howell motor, 3 phase 60 cycle 220/440 volts.
All in good condition—less than five years old.

PELTON STEEL CASTING CO.
MILWAUKEE 7, WIS.

FOR SALE

400 Lineal feet Louden supertrack, 500# to 2000# capacity with 3 switches, hangers, bolts and 8 trolleys. Address: KEEN FOUNDRY CO., GRIFFITH, INDIANA.

Classified Advertising

For Sale

FOR SALE

WHEELABRATOR, AMERICAN, No. 1 Multi-table, 45" Dia., complete with Dust Collector—used, good condition—$1750.00.
WHEELABRATOR, AMERICAN, Cabinet type, Serial A-33210, used, good condition—$1250.00.
2—CRESCENT LO-LIFT ELECTRIC TRUCKS platform 24" x 42", 2500 lb. cap., with Battery—used, good condition—Each $500.00.
1—ELWELL PARKER ELECTRIC TRUCK lo-lift—platform 24" x 52" 4000 lb. cap. with Battery—used—$700.00.
BUDGIT ELECTRIC HOISTS, 250 lb., 15' lift, 1 ph., 110 volt, 60 cyc. Excellent Condition. EACH $65.00.
1000 lb. BUDGIT ELECTRIC HOISTS 220 volts, 3 ph., 60 cy.—used. EACH $95.00.
1000 lb. BUDGIT ELECTRIC HOISTS 440 volts, 3 ph., 60 cyc. used. EACH $90.00.
1 ea. 3 TON YALE, MODEL 20B, ELECTRIC HOIST with Trolley attached. D.C. 220 volt, used—EACH $300.00.
1—TON SHEPARD ELECTRIC HOIST D.C. with powered Trolley, 230 volt, used—$250.00.
AMERICAN MONORAIL NO. 417. Girder Rail—excellent condition—per ft. $2.25.
AMERICAN MONORAIL BRIDGES, 1 Ton cap. 20' Span, hand type push—excellent cond. EACH—COMPLETE $75.00.
4 WHEEL PLATFORM TRUCKS Hitch & Hook type 36" x 80"—used. EACH $25.00.
4 WHEEL PLATFORM TRUCKS Tongue type, all steel, Rubber tires, 48" x 120"—19" high, used. EACH $50.00.
JEFFREY PORTABLE CONVEYOR, elec. 220/440 3 ph. 60 cyc. 39" wide x 17' long, adjustable Height to 10 ft., wood slats, used. $400.00.
GRINDER & BUFFER comb., swing frame type powered by 15 hp Westinghouse Motor 3 ph. 60 cyc. 220/440, belt driven wheel speed 9500 SFPM. Mfg.—Marschke, excellent condition. $400.00.
IIg UNIT HEATERS, steam 217,000 B.T.U., A.C. 110 or 220 v. New, EACH $165.00.
DUSTOP—AIR FILTERS 10 x 20 x 2. New, EACH $ .25, 5½ x 9¼ x 1¾ New, EACH $ .10.
Rotating FORGE BLOCKS to hang from Crane, D.C. 220 volt, 25 Ton Cap. New $2000.00. 15 Ton Cap. New $1250.00.
2000# Jib cranes, pedestal type 10' boom $150.00 ea.
4000# Jib crane, pedestal type 15' to 20' booms $250.00 ea.
All Types ROLLER CONVEYOR.
All Items subject to prior sale and FOB Cincinnati, O.

237 MILL ST., CINCINNATI 3, OHIO
CHERRY 2217
ALLIED SALES

FOUNDRY EQUIPMENT

2—Simpson Mixers, size No. 2.
8—275-J Osborn Jolt Squeezers.
2—Coombs Riddles.
2—Model "S" B. & P. Screenarators.
1—Gardner-Denver Air Compressor, 130 cu. ft. actual—V belt drive with motor.
1—45" Cutler-Hammer Magnet—like new.

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., Not Inc.
767 MILWAUKEE AVE., CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

One Modern Equipment Company quick detachable teapot spout ladle—9900 lb. steel capacity, worm and worm-wheel gearing, square bail. In nearly new condition. This ladle surplus with us and has been used for only two heats. Address: American Hoist & Derrick Co., 63 SOUTH ROBERT STREET, ST. PAUL 1, MINN.

FOR SALE

One Herman rollover molding machine like new, 40" x 58" size 18" cylinder independent turnover and drawing machine 45" arms. Equipped with air clamps 40" flask distance combination pattern and flask space 40". 3740 pounds rollover capacity. Address: W. S. BREMER CO., NEW WASHINGTON, OHIO.

FOR SALE

Two 42 x 36 airless type blasting barrels with wheelabrator blasting wheels suitable for shot or steel grit manufactured by Hollingsworth Mfg. Co., Indianapolis, Ind., and suitable for blast cleaning of castings, forgings, etc. Address: ATLAS FOUNDRY CO., MARION, INDIANA.

For Sale

FOR SALE—IMMEDIATE DELIVERY

4"x4"x 23/28 ft. FORGING QUALITY BILLETS

LBS.	CAR.	MANG.	SIL.	CHR.
21,600	.48	.50	.85	
16,250	.52	.76		
20,300	.54	.72	.15	
56,150	.52	.85	.30	1.02
264,150	.57	.69		
168,650	.60	.73	.20	
75,600	.48	.66	.22	.82
106,650	.59	.78	.20	

GLAZER STEEL CORP.
KNOXVILLE, TENN.

CUPOLA FOR SALE

Number 3½ Whiting cupola receiving ladle—blower with motor—skiphoist—electric control magnetic switches—extra cupola blocks and supplies.

EXCELLENT CONDITION
SONITH INDUSTRIES, INC.
50 SHELBY ST.
INDIANAPOLIS 2, INDIANA

AVAILABLE NOW

2—Roto-clone combination dust collectors and exhausts. Type D, size 10, 3 H.P. 3 ph. ind. type motor 220-440 volts. Used. Very reasonable.

GIBBS BOARDTILE CORP.
615 North Aberdeen St. Chicago 22, Ill.

FOR SALE

1—Pallet conveyor, Jeffrey No. 20, 360 ft. of track, motors, 59 cars, elevation above floor 24", cars are spaced 72½", car tops are 48" wide and 60" long of ⅝" steel hydraulic rams pushes molds off conveyor to shake-out.

OLD COLONY FOUNDRY CO.
EAST BRIDGEWATER, MASS.

SAND BLAST MACHINES

We have in stock brand new complete portable sand blasting machines 350 pound capacity in sand. Can be used with steel grit also. New "Sanstorm" type, non-clogging design. Ideal for auto body shops. We also have in stock for immediate shipment a #22 moline portable molding machine (brand new).

FEDERAL FOUNDRY SUPPLY CO.
3600 EAST 71st ST. CLEVELAND 5, OHIO

FOR SALE

3 each Model "V25" Syntron electric vibrators complete with "VCR" controller, 220 volt, 3 phase, 60 cycle.
3 each Model "F1" Syntron electric vibratory feeders, each complete with "FC" controller with 6" x 18" trough, 220 volt, 3 phase, 60 cycle.

SAMUEL OLSON MFG. CO., INC.
2418 BLOOMINGDALE AVE. CHICAGO 47, ILL.

FOUNDRY EQUIPMENT FOR SALE

COMPLETE PRODUCTION LINE FOR ALUMINUM FOUNDRY:
1—Sand preparing and sand handling
1—Raw sand handling system
1—Mold conveyor system
1—Two ton and 10 ton electric conveyor system
1—Ventilating system
1—Auxiliary sand system

1—complete core room including 47' and 67' vertical core ovens and complete machine and handling equipment.

BOX 331
The FOUNDRY CLEVELAND 13, OHIO

For Sale

FOR SALE

MOLDING MACHINES—
5—Tabor Split Pattern Jolt Squeeze Air operated.
1—Tabor Jolt Squeeze, Yoke type, 13" x 18", air operated, serial 27139.
2—Osborn #42, portable.
2—Tabor 10" Special Shockless Jar Squeezer, (end, brg, mch.)

FURNACES

Furnace, elec. heat treat. "Electric Furnace Co." 14' L x 6' w x 6' hi. 250 KW—220 V complete with controls.
Furnace, heat treat "Industrial-Circ Air" gas fired car type, 14' L x 6'6" w x 6' hi., complete.
Furnace, annealing - continuous, "Industrial Heating" 26'6" x 6' w x 16" hi., gas fired, complete.
4—Furnaces, melting "Bellevue" 550# capacity.
1—Furnace, reverb, 33,000#, "Industrial Heating" oil fired—rebuilt in 1941.
Furnace, reverb, 8000#, oil fired.
Blower "American" #6V with motor.
Monarch 300# Crucible Tilting Furnace, with mechanism less motor.
10—Bohn Oil Fired Brass melting furnaces, pit type, for No. 80 crucible.

MISCELLANEOUS EQUIPMENT

3—"Standard" Snagging Grinders, double end, 18" wheel.
Blower, G/E low pressure 32 oz. 1600 CFM with 20-24 hp. motor 3600/3/60/440.
Motor, 25 hp. 1200/3/60/220-440—need rewinding.
North American Blower, 160 oz. 275 CFM with 2 hp motor G/E 3450/3/60/220-440.
"Spencer Turbo" Blower 16 oz. 250 CFM with 2 hp. motor G/E 3500/3/60/220-440.
286—Steel Squeezer Flasks 12" x 18" cope & drag.
463—Tabor flasks 12" x 18" cope & drag.
1—Snap Flask 10" x 20" cope & drag.
1—Snap Flask 14" x 19" cope & drag.
2—Snap Flasks 14" x 16" cope & drag.
1—Snap Flask 13¾" x 18¾" cope & drag.
1—Snap Flask 14" x 14" cope & drag.
1—Snap Flask 12" x 20" cope & drag.
1—Snap Flask 12" x 22" cope & drag.
450—Bottom Boards (wood) 12" x 18".
50—Bottom Boards (wood) 13¾" x 13¾".
50—Bottom Boards (wood) 11¾" x 21¾".
34—Squeezer Flask Uplifts.
250—Flask Weights. 12" x 18".
3 pr Crucible Tongs for No. 80 crucible.
3—Core Setting Tables (revolving).
4—Carrying Shanks for No. 80 Crucible.
"Sly" Sand Blast System 8' x 8' x 7' high with 6' turntable and exhaust system.
"Stoney" vibrator shake-out machine model 8590.
2—"Hausfeld" Mag-Tilt melting furnaces, 1200 lb. cap. complete.
2—Shells for Mag-Tilt melting furnaces.
Molding machine, "Arcade" portable hand draw and jolt 16" x 12" plate.
Sand blast room, "Sly" 10' x 10' compl. with tank, blower and motor.
2—Sand separator and blender, "Roger Jr." w ½ hp motors portable.
Shakeout machine, "Stoney Vibrator" #D-5.
Crane, 2 ton bridge type "Euclid" type IGS, 36' span, 3 motors, cab. oper.
Crane, 2 ton bridge type "Taylor Gaskin" 38' span, 3 motors, floor oper.
Porta trough belt conveyor, mod. 334-T 18" w x 35' l with 5 hp. motor, conveyor is mounted on two wheel truck—made by the Portable Machinery Div. of A. B. Farquhar Co. Ltd. of York, Pa.
Band saw, metal cutting "American" 36" ser. #39016.
Vacuum Cleaner, portable "Spencer Turbine" with 3 HP motors.
Shear, alligator type "Hendley & Whittenmore" #46 less 2 hp. motors.

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG. DETROIT 26, MICH.

FOR SALE

Patent No. 2,052,465 and wood and metal pattern equipment for producing water meter box covers. $1,500.00. Address: FRED E. HARDY, JR., 306 E. MAIN ST., SHELBYVILLE, ILLINOIS, PHONE 570.

FOR SALE

American skip bucket loader in excellent condition. Address: BERRETTINI ELECTRIC CO., 380 N. MAIN ST., PLAINS, PA.

Classified Advertising

For Sale

FOR IMMEDIATE SALE

NEW

1—Roots-Connersville positive-pressure blower 14 x 36" RCS—3450 cfm. at 20 oz. pressure. Complete with 4¾" relief valve, pipe plate, 25 hp, 3 phase, 220V motor; magnetic starter; V-belt drive and Foxboro Automatic Air-weight control based on 3/60/220 VAC.

1—#14 Type D Roto-clone with Type E hopper and 2½ hp 3/60/220-440 motor.

LIKE NEW

1—#7 Type D Roto-clone with Type E hopper, complete with 2 hp., 3/60/220-440 motor.

USED

1—Roots-Connersville blower size 12 x 24 Type SD Serial #11883 with 7½ hp, 1750 rpm, 3/60/220 VAC motor. Blower capacity 1600 cfm.

Location—Northern New Jersey. Available for inspection.

BOX 317
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE

1—48" x 60"—15" solid extended cylinder, heavy duty, Herman Pneumatic Machine Co. Jarring Molding Machine, 9800# at 80# air pressure, 12-15 design, #2 Bunter control valve.

2—Same as above, except 60" x 96", capacity 18,600# with 80# air pressure, 18-20 design. Above machines have never been used.

2—Herman Pneumatic Machine Co. 50" x 60" Rollover pattern draw machine, weight approximately 16,000#. Capacity 6000# with 80# of air pressure.
These units could be used with either of the above jarring machines.

2—Johnson & Jennings #2 Jarring Molding Machines, pin type.

WM. C. JOHNSON & SONS MACHINERY CO., 1211 HADLEY ST., ST. LOUIS 6, MO.

FOR SALE

6—Tabor Stationary Jar-Squeezers in good condition.

19—80 pound oil-fired, crucible-type melting furnaces with covers, Hauck Burners and Mixing Valves.

5—500 pound oil-fired Fisher Stationary Aluminum Melting and Holding Furnaces with Hauck Burners and Mixing Valves.

1—Tilting Furnace, take #400 crucible, equipped for gas firing.

1—Eclipse Crucible Type Brass Melting Furnace, gas fired, catalog #200S.

1—Royer Shakeout Machine with Motor, 64" long x 52" wide, table 29" x 58".

1—Gehnrich & Gehnrich 4' x 4' x 4' Electric Heat Treating Furnace, recirculating fan, Bristol Cam Controller, two Bristol Electronic Safety Limit Controls, Bristol Temperature Time Recorder.

1—Gehnrich & Gehnrich Gas-fired Heat Treating Furnace 30" x 6' x 9'. Partlow Temperature Control, Partlow Safety-Glo Control, Bristol Electronic High-limit Control, Brown Instrument Time Temperature Recorder.

OLD COLONY FOUNDRY CO. E. BRIDGEWATER, MASS.

FOR SALE

Used Demmler core blower style No. 4. Good condition. Price reasonable. Address: Box 330, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Model 918 Johnston & Jennings molding machine—table size 44 x 54—18" draw—2000 lb. cap. Johns-Manville asbestos core plates 5 x 29 50c ea. American Wheelabrator—table type sand mixing machine and dust collectors. Automatic electric fork lift trucks—3000 lb. cap. Complete with lifetime Edison batteries $1500.00 ea.

WE INVITE YOUR INQUIRIES

BALCHER MACHINERY SALES 1884 S. COMPTON RD. CLEVELAND HEIGHTS 18, OHIO

For Sale

EXCESS EQUIPMENT

86 Steel Flasks 8" x 36" x 72" heavy duty.
34 Flat Cars 36" x 72" x 8" high.
500' Link Belt Roller Chain for apron-type conveyors with steel rail and six sets sprockets, shafts, pillow blocks, etc.
200' Mathews Gravity Conveyor, Type 2 K53 2 9/16-12-10 including six 45 degree curves.
5 Racine Hydraulic Units—operating pressure 450-700 P.S.I. with 60 gal. reservoir, G.E. 7½ V.A.C. H.P. motor, and necessary metering, check, and shut-off valves.
2 Manning, Maxwell and Moore 1 Ton Shaw Box Hoists No. 1178 220-3-60 A.C., push button control with two type E-Sun Traveling Bridge Cranes, span 17'9".
2 Cleveland Speed Reducers Gears Size 100AT Series 25-D 18½:1.
2 Robbins and Meyers Electric Hoists, Type F.1-B 4,000 lbs. capacity with cable 40' long.
1 Ingersoll-Rand Air Compressor, 13½ x 8 x 8 x 8 XE 2 with direct connected 100 H.P. 440-3-60 I.O.P.F. 450 R.P.M. Synchronous Motor.

Large quantity varied sizes air cylinders, hydraulic pistons, pillow blocks, shafts, steel pulleys, solenoid valves, and 4" pressure pipe, valves and fittings.

G. W. VANDERVORT CO. P.O. BOX 580 PORTSMOUTH, OHIO

FOR SALE

85—10' sections and 4—90° curves of Lamson ball bearing roller gravity conveyor, each section 10' long, 2½" diameter rolls #10 gage, 24" long rolls on 3" centers in high position between 4¼ x ¼ thick, uniframe side members. Like new—never used. Purchased last year. Will sell for our exact cost $81.98 per section f.o.b. our plant. Available for inspection, @ $9.28. Address: LUDLOW VALVE MFG. CO., INC., TROY, NEW YORK.

FOR SALE

1—18" x 25" Roots-Connersville positive pressure blower with 125 H.P. 440-3-60 motor.

1—Motor operated butterfly valve.

4—3 ton Whiting steel converter shells with two tilting assemblies.

1—Champion 48" x 48" x 8" draw power flask push off machine.

2—Osborn jolt, squeeze, rollover, draw molding machines.

GUNITE FOUNDRIES CORP. ROCKFORD, ILL.

CENTRIFUGAL BLOWER

1—Ingersoll-Rand Direct Connected Electric Motor Driven Centrifugal Blower 8700 C.F.M. 1.25# per square inch pressure, 3500 R.P.M. complete with 75 H.P. 3 Phase 60 Cycle 220 Volt 40 Deg. C. Rise Ball Bearing, Squirrel Cage, Induction Type, Standard Open Motor, Manual Reduced Voltage Starter, Blast Gate Mechanism for Constant Air Weight Control assembled to 1-R Blast Gate and including two (2) Current Transformers and one (1) Air Weight Ammeter Calibrated in lbs. of Air per minute and also Amperes. First Class Condition.

G. & C. FOUNDRY SANDUSKY, OHIO

FOR SALE

One model 94 Osborn core blowing machine
For Large and Heavy Cores

PRACTICALLY NEW—NOW OPERATING—

ATTRACTIVELY PRICED

WRITE FOR COMPLETE SPECIFICATIONS

ERIE MALLEABLE IRON COMPANY

ERIE, PENNSYLVANIA

For Sale

FOR SALE

Type "T" lectromelt steel furnace in perfect condition. Takes thousand pound charges and melts at rate of five hundred pounds per hour. Primary voltage thirteen thousand two hundred—price $8500 cash. ADDRESS: DOWLING FOUNDRY CO., SAVANNAH, GEORGIA.

FOR SALE

One (1) Roots-Connersville rotary type blower serial #37880, size #7. In good condition. Inspection or inquiry at: GARDNER DENVER COMPANY, QUINCY, ILL.

FOR SALE
CRUCIBLES

Approximately 70 size 400 and approximately 100 size 225 tercod crucibles, new. Very reasonable. Also approximately 1000 new #77 graphite stoppers. Address: SILBEY IRON & METAL CO., BLADENSBURG, MARYLAND.

FOR SALE

Simpson type "O" intensive muller type mixer complete with gear reduction less motor. Roto-clones size D-8 and D-10 complete with TEFC 4000#. Address: PLANT EQUIPMENT CO., motors. Pillar cranes "Shaw Box" type SSJ, CINCINNATI 14, OHIO.

FOR SALE

1—Whiting cupola No. 7—72" dia. shell. Excellent condition, ready to load on cars or truck. Address: SMITH FOUNDRY & MACHINE CO., NORTH BALTIMORE, OHIO.

FOR SALE

Cupola furnace, Whiting standard #1, in good condition. 500# bull ladle with shank. Sturtevant steel pressure blower #4. Address: M. G. MORGAN, ASST. BUSINESS MANAGER, VALPARAISO UNIVERSITY, VALPARAISO, INDIANA.

FOR SALE

1—Coleman junior No. 2 oil fired core oven—5 drawers 30" x 42". Slightly used, condition good. Address: KEOKUK STEEL CASTING CO., KEOKUK, IOWA.

FOR SALE

4—Whiting standard 19" diameter by 16" long cylindrical ladles with hinge cover, capacity 210#, used less than 20 days, practically new, price right for quick sale. Address: Box 311, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Cupola, 66" with 40 ft. stack. No controls or blower. Price $1,200; if loaded on car $1,400. Address: NATIONAL PLUMBING & FIXTURE CORP., ELLWOOD CITY, PA.

Foundries For Sale

FOR SALE

BRASS FOUNDRY AND MACHINE WORKS. One of the best housed and best equipped plants west of the Mississippi. Business established over 25 years. Owner to retire. New, modern, centrally located, brick building 100 x 125 ft. Included are the real estate, business, patents, copyrights, equipment and stock. All clear. Priced at $125,000. Terms. Further information upon request.

FOSTER & BARNARD INC.
ONE OF DENVER'S "WELL-KNOWN" REALTOR-INSUROR ORGANIZATIONS.
CHAMBER OF COMMERCE BUILDING
DENVER COLORADO

GRAY IRON FOUNDRY FOR SALE

Located in the Piedmont section of North Carolina. 10,000 sq. ft. of floor space. Concrete block and steel building, completely equipped with squeezers, sand blasting and shot cleaning equipment. $50,000 will finance. Address: Box 306, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Nonferrous aluminum and brass foundry well established. Business building brick and tile, open span 50 x 155 and vacant 100 x 155 all fenced in. Rapidly growing city in Middlewest. Valuation of property alone $50,000.00—total price $70,000.00. Address: TULSA BRONZE WORKS, 1428 EAST 4th ST., TULSA 6, OKLAHOMA.

Classified Advertising

For Sale

NONFERROUS FOUNDRY FOR SALE

Well established business employing 40 people located within 100 miles of Detroit in Central Michigan on railroad siding. Building is cement block with concrete floor, 40 x 220 with frame and annex 50 x 40 and other storage buildings. Have chemical laboratory and separate air conditioning office building. Foundry is modern throughout with overhead hoppers, bench and floor molding facilities. Has ten gas fired and ten pit coke fired furnaces. Owners wishing to sell have other interests. If interested write:

BOX 333
THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRIES FOR SALE

GRAY IRON FOUNDRY—Very profitable medium size foundry. Well established business. Priced low as owner is retiring.

GRAY IRON FOUNDRY—Produces castings up to 5 tons. Good building and equipment. Price $90,000.

EDWARD H. ZOLL
Industrial Properties Throughout the East
790 Broad St. Newark 2, N. J.

For Sale

FOR SALE

1 Ingersoll Rand direct motor driven cupola blower. Pressure 1.25 lbs. Volume 7500 Cu. Ft. per minute.

NEW HAVEN FOUNDRY
NEW HAVEN, MICHIGAN

Employment Service

SALARIED POSITIONS
$3,500—$35,000

If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (38 years recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 DUN BLDG. BUFFALO 2, N. Y.

SALARIED PERSONNEL

$3,000—$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

EMPLOYERS
SERVICE BUREAU
A SUPERIOR PERSONNEL SERVICE
FOR DISCRIMINATING
EMPLOYERS
ESTABLISHED 1922

Specializing in thorough screening of qualified personnel for any phase of foundry operations.

APPLICANTS

If you can furnish QUALIFIED references attesting to your CAPABILITY and DEPENDABILITY, your application will be accepted and we will secure for you the desired position, without cost. Our service is 100% FREE to applicant.

IMMEDIATE OPENINGS
Partial Listing

SUPERINTENDENTS
ASS'T. SUP'TS.
GENERAL FOREMEN
CORE ROOM FOREMEN
MELTING FOREMEN
MOLDER FOREMEN
CLEANING ROOM FOREMEN
CUPOLA SUPERVISORS
SR. INDUSTRIAL ENGINEERS
JR. INDUSTRIAL ENGINEERS
TIME STUDY ENGINEERS
MASTER MECHANICS
PLANT ENGINEERS
MAINTENANCE SUP'TS.
MAINTENANCE FOREMEN
LABOR FOREMEN
METALLURGISTS
CHEMICAL ENGINEERS
CHEMISTS
PRODUCTION CONTROL
SALES ENGINEERS
ACCOUNTANTS

If you are experienced in any phase of foundry operations—and desire to improve your future working conditions:

WRITE
EMPLOYERS SERVICE BUREAU
33 WEST WASHINGTON ST.
CHICAGO 2, ILL.
TELEPHONE: FINANCIAL 6-1155

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words, $2.00. Additional words 7c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $4.00. Additional words 12c each.

NOTE—If replies are to be sent to a box number in care of THE FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 12.00	$ 11.00	$ 10.00	$ 9.00
2 inches	21.75	20.00	18.25	16.75
3 inches	32.00	29.25	26.75	24.00
4 inches	40.00	36.75	33.25	30.00
5 inches, ½ col.	48.00	44.00	40.00	36.00
6 inches	58.75	53.25	48.00	42.75
7 inches	66.00	60.00	54.00	48.00
8 inches	73.25	66.75	60.00	53.25
10 inches, 1 col.	88.00	80.00	72.00	64.00
Half Page	130.00	120.00	110.00	100.00
Full Page	220.00	200.00	180.00	160.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

THE FOUNDRY

Penton Building, Cleveland 13, Ohio

Location: CINCINNATI OHIO

WHEELABRATORS

Electric Traveling Cranes
Heat Treating & Plating Equipment

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Pangborn AIRBLAST CLEANING ROOM

Loads or Unloads Quickly From Both Ends

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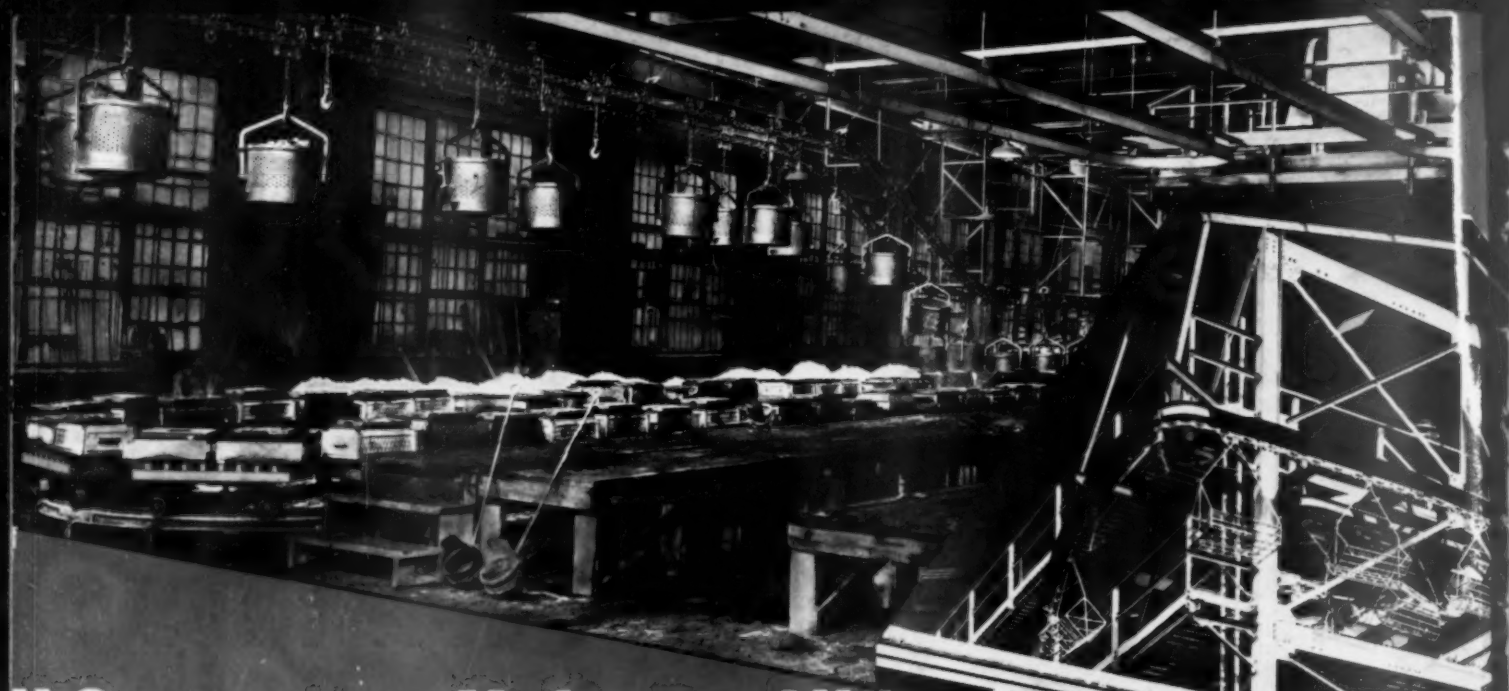

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LINK-BELT Overhead Conveyors for foundry mass production

Castings being handled through cooling cycles to cleaning rooms —sprue being dumped automatically at discharge station and finished cores being transported to foundry operations.

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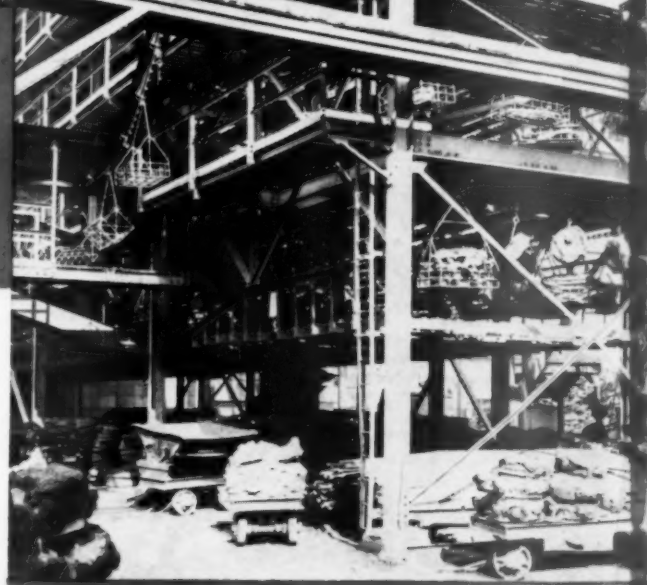

Top picture: Castings from shakeout stations handled in perforated buckets suspended from trolley conveyor. Above right: cooling tower with overhead conveyor handling individual castings. Below: pictures left to right show overhead trolley conveyors handling and automatically discharging sprue in charge make-up area, mold conveyor and core transport and storage conveyor, respectively.

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